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AN EXPERIMENTAL STUDY OF CHILDREN

THE MACMILLAN COMPANY
NEW YORK—BOSTON—CHICAGO
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MACMILLAN & CO., LIMITED
LONDON—BOMBAY—CALCUTTA
MELBOURNE

THE MACMILLAN CO. OF CANADA, LTD.
TORONTO

AN EXPERIMENTAL STUDY OF CHILDREN

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AT WORK AND IN SCHOOL BETWEEN THE AGES OF FOURTEEN AND EIGHTEEN YEARS

BY
HELEN THOMPSON WOOLLEY, Ph.D.
Formerly Director of the Vocation Bureau of Cincinnati

New York
THE MACMILLAN COMPANY
1926

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Set up and electrotyped. Published March, 1926.

Printed in the United States of America
By The Cornwall Press

PREFACE

The publication of this volume has been made possible through the interest and generosity of the Schmidlapp Fund and the Helen S. Trounstine Foundation, of Cincinnati. The successful prosecution, through many years, of the study of which this is a report, has been due to the genius of the author, Helen T. Woolley, to the unflagging devotion of her staff, and to the faithful support and good will of a number of public-spirited residents of Cincinnati, who have held steadily during the inquiry to its sole object—the better care of boys and girls both here and elsewhere. For the privilege and pleasure of association with them all throughout the progress of the study, the undersigned are deeply grateful.

M. Edith Campbell,
Edward N. Clopper,
Trustees.

AUTHOR'S PREFACE

The manuscript of this book was completed in 1922—a fact which needs to be kept in mind in reading it. Few changes have been made in it since then. The three years and more since its completion have been required to arrange for its publication and to put the manuscript through the press. It is sent out now with a keen appreciation of its shortcomings, statistical and otherwise, but with the hope that it may add something to our accurate knowledge of the conditions which surround youth.

Most of the appropriate acknowledgments are made in the first chapter, that on History of the Investigation. In addition I would like to express gratitude for help in the arduous tasks of proof-reading and index-making to my daughter, Eleanor F. Woolley, my friend, Elizabeth Cleveland, and my secretary, Amelia Wyckoff.

Detroit, Michigan
January 31, 1926

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AN EXPERIMENTAL STUDY OF CHILDREN

CHAPTER I

HISTORY OF THE INVESTIGATION

In the year 1910 the State of Ohio passed a new child labor law, which proved to be the inauguration of a new era in education—an era in which the educational interests and projects of the State began to expand to cover not only the children whose family background and educational ideals kept them in school, but also that vast number who, through school failure, lack of ideals, or economic pressure, were pouring out of the schools as soon as the law permitted. The new law contained several important educational provisions. It required the completion of a definite unit of education before any child was allowed to leave school—in this case the fifth grade. It provided for the issuance of employment certificates by the school for specific positions which conformed to all the restrictions of hours and types of work imposed by the law. Since these certificates were for specific positions only, it became necessary to reissue them every time the child changed his position. Up to sixteen years of age, therefore, every child became subject to some authority and supervision by the school. Finally, the law provided that part-time schools for children employed on certificate might be established by the local board of education, and if established, such schools became compulsory for every child who had not completed the elementary school.

This pioneer law, whose main outlines have since been adopted by most of the states, was due to the concerted efforts of many educators, social workers, labor organizations, and interested citizens. Prominent among those who worked for its passage were Mr. Frank B. Dyer, then Superintendent of Schools in Cincinnati, Miss M. Edith Campbell of the Schmidlapp Bureau of Cincinnati, and Mr. E. N. Clopper of the National Child Labor Committee. Having secured the passage of the law, these socialized educators and educationalized social workers were anxious to take advantage of it to make a real contribution to the common field of knowledge on which progress both in education and in social work depends. Accordingly Miss Campbell and Mr. Clopper planned a comprehensive investigation of the whole group of children who were leaving the schools to enter wage-earning occupations as early as the law permitted them. The new law gave the schools, for the first time in history, some legal hold over the entire body of working children up to the age of sixteen years. Mr. Dyer, who was given by law the right to issue employment certificates or to delegate that authority to some one else, turned over to Miss Campbell and Mr. Clopper the task of organizing and administering the employment-certificate office in such a way that it might be effective both in carrying out the purposes of the law and in serving as a means of investigation.

The plan which Miss Campbell and Mr. Clopper worked out had as its central purpose, a five-year study of a large and representative group of working children, which was to cover the mental and physical status of the children from year to year, their industrial histories, their home conditions, and if possible their social histories. They succeeded in interesting Mr. Schmidlapp, and a small group of men of means* to pledge the funds for a period of five years. The project was so new, and the public so unfamiliar with the idea of educational responsibility about children who had left school, that it was impossible to secure financial help from the Board of Education. Indeed at the start, Miss Campbell and Mr. Clopper expected to make a contribution to the Board of Education by administering the employment-certificate office during the five-year period and then turning it back to the Board with at least the addition of a good method of issuing and recording employment certificates, and a valuable set of statistics about them.

The office was opened in a room of the City Hall on the first of September, 1910, with Mr. Roger L. Conant in charge of issuing the employment certificates. After some preliminary attempts to get the work organized with a divided authority for its legal, industrial, and scientific phases (1),† the trustees of the fund decided that the only thing to do was to secure a director for the entire project. It was obviously impossible to find any one person equally well-qualified to undertake the industrial and the scientific phases of the investigation. Since the mental and physical measurements were so essential a part of the plan, and the training required to do that part of the work was so specific, the trustees decided to select a psychologist as director. Mrs. Helen T. Woolley was chosen for the post, and began her duties in March, 1911.

DEPARTMENTS OF WORK

From the start, the Bureau was responsible for the issuance of employment certificates under the new law. The card system for recording certificates issued; the method of recording successive positions held and classifying them both by the child and by the employer; the system for securing proper coöperation from the schools on the one hand and the employers on the other; the verifying of birth records; the plan for securing medical inspection of working children and treatment of those found to be defective;—all this devolved upon the newly organized staff. Most of the time of the period from September, 1910, to March, 1911, was occupied with the development of the employment-certificate system.

---

*The other contributors were W. H. Alms, L. A. Ault, Mrs. Thomas J. Emery, Edward Senior, John B. Scarborough, Sidney Pritz, James N. Gamble, Harry Levy, and Omer T. Glenn.

†Numbers in parentheses which occur in the text refer to references to literature at the end of the Chapter.

In March, 1911, the series of mental and physical measurements of working children was begun. The first test was made at the time that the first employment certificate was issued. All of the details of selection and procedure are discussed in later chapters. In November of 1912 the control series of measurements of school children was begun. The keeping of detailed industrial histories for the working children tested began at the time of the first tests. During the first year, the visits to the homes of working children began. These activities occupied all of the time of the staff for the first four years. Although pressure was brought to bear to persuade the Bureau to take over diagnostic work for the schools and for the social agencies of the city, it was resisted bravely until the end of the experimental work for the special investigation was in sight.

Additional experimental work was not the only temptation we had to resist. The employment-certificate office took no responsibility about finding positions for children, but many interested friends felt that we should open a placement office and begin advising children about the selection of specific jobs. At the start we were totally unwilling to undertake such a responsibility because we knew too little about either the children or the occupational world of Cincinnati. Furthermore, the types of work open to fourteen-year-old children and the immaturity of many of the children made us feel that employment for them was all wrong, and that we did not wish to have any official part in the system further than that of protecting children as best we could through the machinery of the child labor law. In 1913 a new law went into effect which increased the age and school grade requirements one year for boys and two years for girls. Placing fifteen-year-old boys who had completed the sixth grade and sixteen-year-old girls who had completed the seventh grade seemed to us a more hopeful project than the placement of fourteen-year-old children. By 1915, after four years of contact with local industries through the employment-certificate office, we felt that our knowledge of the whole situation was sufficient to make it probable that we could do better in placing children than they could in finding their own positions. Accordingly the placement office was opened as part of the Bureau in 1915.

By 1916, the actual testing of our original series was far enough advanced so that it did not require the entire time of the laboratory staff. The treatment of the enormous mass of data accumulated could easily have occupied all the time of the staff and more. However, by that time the possibilities of the laboratory as a diagnostic center for schools and social agencies were not only evident but alluring. Although we had lost Mr. Dyer as Superintendent of Schools, he had been succeeded by Mr. Randall J. Condon, who proved to be just as vitally interested in the work of the Bureau, and just as anxious to use its resources for the benefit of the schools, as Mr. Dyer had been. Mr. Condon wished to assign to us as a first task the duty of examining all the children who were suspected by the teachers of a degree of mental retardation which made them suitable candidates for the school for defectives. We accepted the task, but found, of course, that it was only the beginning of requests and responsibilities. Diagnosing and advising children who were not defective but merely retarded, making special studies of high-school failures, examining superior children for rapid progress, and making special studies of children who were primarily problems of behavior, were all tasks so interesting and so legitimate that it seemed impossible to thrust them sternly aside in order that we might devote ourselves to the completion of the statistical work of our main investigation.

Another situation which tended to withdraw effort from our large statistical task was the war. The time and energy of our trustees, of the director, and of most of our volunteer workers were diverted to the pressing problems of various war agencies. The Council of National Defense and the Red Cross, in the departments of their work dealing with women in industry, with child labor, with child welfare, and with Junior Red Cross activities, absorbed the time and thought which would otherwise have gone into research. As a result, some departments of the work of the Bureau derived unforeseen benefits, the most notable of which was a scholarship committee for keeping superior children in school. The committee was organized as a subdivision of the Child Welfare Committee of the Women's Divisions of the local Council of National Defense. After the war, the committee became a department of the Bureau, financed by the Council of Social Agencies—a point to be further considered when the topic of finance is discussed.

However, the end of the war did not bring an end to the duties assigned to the Bureau. In 1919, the psychological work of the Juvenile Court was given to the laboratory of the Bureau. The testing is done at the court by assistants working under the director of the laboratory, and duplicate records are filed in the main laboratory. The growing interest in problems of behavior led to the assignment of one worker to deal with difficult behavior problems as school, rather than as court, cases. Finally, since so many of the activities of the attendance department of the schools dealt with children who needed the services of the employment-certificate office, the placement office, the psychological laboratory, or the court, it seemed wise to have that also consolidated with the Bureau.

While all of this growth was most satisfactory from the point of view of building up a large and valuable department of the system of public education,* it did not result in getting the statistical work of our main investigation done, or the results written up. Finally in 1920-1921 the National Child Labor Committee, through the influence of our trustee, Mr. Clopper, and the Helen S. Trounstine Foundation of Cincinnati, through the influence of Miss Campbell and Mr. Condon, furnished the salary of a statistical worker for a year. The following year, 1921–1922, the Helen S. Trounstine Foundation and the Vocation Bureau united to furnish the salary of a statistical worker and to set the former director free for the task of interpreting and formulating of results.

QUARTERS

In 1911, when the work of investigation began, the Board of Education had its quarters in the City Hall. One large and rather noisy room on the second floor of this building was assigned to the new bureau. Employment certificates were issued at one end, and tests administered behind a curtain at the other end. The arrangement was entirely unsatisfactory for tests, and fortunately lasted but three months after the testing began. In the fall of 1912 the department was moved to an abandoned high-school building in the colored district down town. We had one small room for issuing certificates, one large school room for testing, and one former dressing room which could also be used for testing. Although the dirt from neighboring railroads and factories poured down upon man and paper at such a rate that it was impossible for either to be clean more than a few moments and the street noises were insistent, nevertheless the greater space and privacy constituted a real improvement over previous conditions. We stayed in this building for two years, when the fire department refused to allow its orders to vacate to be further postponed. Our next move, in 1914, was to another abandoned school building, also down town, but in a good business district. Here we had the advantage of still more space, and of subdivisions in the rooms which made for better experimental conditions. The dirt was a trifle less insistent, and the streets were freer from crime. It was in this building that the placement office was established. The office remained here for two years, when the Board of Education sold the building. Just at this time, 1916, the Board of Education had to give up its quarters in the City Hall. To provide space for all of its departments, including the Bureau, the Board rented one floor of an office building in an excellent down town neighborhood. The floor space assigned to the Bureau was far less than it had had in its previous quarters. The rooms were small, the partitions thin, and for a year the work was conducted under a genuine disadvantage so far as experimental conditions are concerned. The following year, 1917, the Board rented an adjoining floor of the same building, and assigned additional space to the Bureau. It has now expanded to occupy an entire floor of the building, and is very adequately and comfortably housed.

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*For a fuller discussion of the growth and function of the Bureau, see (2).

FINANCE

During the first year or two of its existence, the Bureau was financed entirely from private funds, administered by Miss Campbell and Mr. Clopper as trustees. Even the salary of the official who issued the certificates was paid from this fund. The only part of the expense met by the Board of Education was furnishing quarters and providing the printing and postage necessary in issuing certificates. After about two years, the Board began paying some of the salaries. It first took over the salary of the assistant who issued working certificates. A little later a second person was added to that staff. When the placement office was opened in 1915, the Board paid all the expense of the printing and equipment, and part of the salaries. About 1916, when the laboratory was assigned definite duties in connection with the administration of the schools, the Board began paying the salaries of some of the laboratory assistants, and the printing and postage for this division also. It has always provided quarters for all of the activities of the Bureau.

The private funds on which the work began were pledged for five years. About the end of that time the centralized budget plan for raising money for a large group of social agencies was adopted, and the Vocation Bureau was included in the group. Mr. William J. Norton, who was at that time at the head of the Council of Social Agencies, and Mr. C. M. Bookman, his successor, have given a constant support and understanding help to the project which cannot be too warmly acknowledged. The Bureau has continued up to the present time to be one of the constituent members of the centralized budget plan of the Council of Social Agencies. The funds assigned it have increased, with the addition of new duties, from about $6,000 to $20,000 a year. The funds furnished by the Board of Education have increased from mere rent and incidentals to a sum at least twice that furnished by private funds, though it is difficult to estimate exactly because much of the overhead expense is not figured separately for the Vocation Bureau.

The largest increases of funds from the Council of Social Agencies came in response to additional work undertaken in connection with the Juvenile Court and problems of delinquency, and additional work taken over by the Bureau when the activities of the Council of National Defense came to an end. The salaries of the two assistants who work in the clinic of the court have been paid in part by public funds of the court itself, and in part by private funds from the central budget. The salary of the worker who was detailed to deal with incipient cases of delinquency was paid from the private fund. The scholarships for superior children, established by the Child Welfare Committee of the Women's Division of the Council of National Defense, were taken over on private funds, and have since been increased in amount. The private fund has always met part of the salaries of the psychological laboratory assistants. During the last two years, the National Child Labor Committee and the Helen S. Trounstine Foundation of Cincinnati have furnished the money to complete the statistical work of the present piece of research and to provide for formulating the material. All of the money for research has thus been met from private funds.

STAFF

The staff engaged in carrying out the special investigation reported in this volume has usually consisted of from three to five full-time workers, one or two part-time workers, one or two volunteers. All of the laboratory workers have been college-trained people with some preparation in experimental psychology. The director, Mrs. Woolley, was personally responsible for training each laboratory worker in the administration of the tests used, and for overseeing all of the laboratory work.

The only two members of the personnel who remained with the Bureau from 1911 to the time the work was completed were Mrs. Woolley and Mrs. Charlotte R. Fischer, of the laboratory staff. In carrying out so complex a project, all of the departments played a part. The employment-certificate office and the placement office helped in the follow-up work and in recording industrial histories. It is impossible to make personal acknowledgment to all of those who contributed. We do desire, however, to record here the names of all those who devoted as much as two years primarily to research. The list of names, in the order of their connection with the Bureau, is as follows:

LABORATORY WORKERS

Helen T. Woolley, Ph.D.
Charlotte R. Fischer
William Spencer
Frances A. Foster
Rose Rankin (now Mrs. Homer Sluss)
Edward S. Jones
Mary Thomas
Warren W. Coxe

LABORATORY VOLUNTEERS

Frances Forchheimer (now Signora Adeodato Rapicavoli)
Stella Heinsheimer

HOME VISITOR
Louise Boswell

VOLUNTEER HOME VISITOR
Anna Smith (now Mrs. Robert Black)

STATISTICAL WORKER
Grace I. Atchinson

All of these workers have made important contributions, and should be regarded as co-authors. All of the laboratory staff worked on the evaluation of results and statistical summaries, but Miss Grace Atchinson is responsible for the large labor of gathering up all these loose ends, completing the statistical summaries, and preparing the material for interpretation and presentation in the text. No one who has not seen the library of folders, cards, and great sheets of summaries of various phases of the work which she has had to systematize, complete, correct, and correlate, will realize the magnitude of the undertaking. We have all of us been in constant danger of being completely swamped in the morass of complex detail which we have accumulated. Miss Atchinson has been the rescuer. Needless to say there are still countless aspects which might be subjected to further statistical treatment, and countless further correlations which might be worked out. The complete statistical treatment of so great a mass of detail has never been carried out. It is due to Miss Atchinson's devotion for two years that we have been able to proceed as far in the presentation of the material as the analysis contained in the following chapters. Meanwhile the records are preserved in such form that further aspects can be treated as interest or occasion arises.

References

(1) Woolley, Helen Thompson and Fischer, Charlotte Rust—"Mental and Physical Measurements of Working Children," *Psychological Monographs*, 1914, No. 77. Psychological Review Publishing Co., Princeton, N. J.

(2) *The Vocation Bureau of Cincinnati.* Cincinnati Public Schools, 1922.

CHAPTER II

PLAN OF THE INVESTIGATION AND METHODS OF WORK

Selection of Cases

In sketching the history of the investigation in Chapter I, we have explained how we happened to begin with a group of working children, and have related how we came into control of the office which issued employment certificates to children. The laboratory was established adjoining the employment-certificate office. We decided to restrict the group to be studied to native-born white children who were fourteen years of age, but less than fifteen. The inclusion of colored or of foreign-born children would have introduced a complication which would have rendered the interpretation of results difficult. In Cincinnati these two groups are relatively small.

Whenever a child who fulfilled these requirements came to the employment-certificate office, he was referred to the laboratory. If one of the laboratory staff was free to do it, the child was given the series of tests and measurements decided upon for year fourteen. A card giving a few additional facts about his family and home conditions was also made out. This card was called Schedule One, and is reproduced later in this chapter with the other schedules.

The staff of the laboratory was never large enough to examine all of those who would have been eligible for tests. We kept on examining fourteen-year-old children until we had examined 753 of them. This was about one-third of the total number of employment certificates which the office was then issuing in the course of a year. The work covered the period from March, 1911, to June, 1912, and overlapped the beginnings of the first reëxaminations. We considered one-third of the total number of children who entered industry in the course of a year as a fair sample of the whole. The distribution of these children by school grade proved to be approximately the same as that for the entire group (1, p. 39), which also indicates that our sample was representative.

Although interest at the start was centered in working children, we realized that in order to interpret a series of mental and physical measurements of children in industry, it would be necessary to have corresponding measurements of children in school. It was impossible to undertake the testing of school children until our work with the industrial group was well under way. It was in November, 1912, one and a half years after the first tests of working children were made, before we could begin with the school children. In the attempt to make the two series correspond as closely as possible, schools which were sending the largest number of children into industry, according to the records of the employment-certificate office, were chosen as the source of our school series. We even tried to make the school-grade distribution correspond in the two series, but that proved to be impossible because there was not a sufficient number of fourteen-year-old children in grades five and six left in the schools to correspond with the number in our working series, so prevalent was the custom of leaving school among retarded children. The relative grade distributions of the two series are shown in the following table.

TABLE I

GRADE DISTRIBUTIONS OF WORKING AND SCHOOL SERIES AT FOURTEEN YEARS

Series	School Grade Completed*				
	V	VI	VII	VIII	IX
Working	193	229	206	114	11
School	152	244	307	258	10
Total	345	473	513	372	21

*There are no cases below the fifth grade because no children could legally leave school until they had completed the fifth grade.

The detailed discussion of the relation between school grade completed at fourteen and rate of elimination from school, and between school grade completed and rank in mental and physical tests, will be taken up in a later chapter. Suffice it to say here, that for a series chosen as ours was, from schools sending the largest number of children into industry and with a school grade distribution approximating that of the group which was leaving school at fourteen, elimination from school proved to be so rapid that by the age of sixteen so few of our original school group remained in school (only 322 out of our original 760) that the number was too small to use in establishing norms of mental measurement for school children. Since one of our purposes was to establish the degree of difference, mental and physical, between the average school child of a given age and the average working child, regardless of what the explanation of the facts might be, we added 211 more sixteen-year-old children, chosen from Hughes High School, to our sixteen-year-old school group.

In the discussion of results, the original school series will be referred to as X_1 and the supplementary one as X_2. To show the relationship of the two groups to one another, and to the working group, referred to as the M series, Table 2 has been made out. The X_2 series is entered in the table according to the grade the children had completed at fourteen years, though they were given their first test at sixteen. The two series can thus

TABLE 2

SCHOOL GRADE DISTRIBUTION AT TIME OF FIRST TEST

BY SEX AND SERIES*

SERIES	SCHOOL GRADE														
	V			VI			VII			VIII			IX		
	B.	G.	Total	B.	G.	Total	B.	G.	Total	B.	G.	Total	B.	G.	Total
Working	124	69	193	127	102	229	108	98	206	59	55	114	5	6	11
School 1	86	66	152	111	99	210	119	102	221	110	65	175	2	0	2
School 2	0	0	0	34	0	34	50	36	86	35	48	83	2	6	8
School 1 and 2	86	66	152	145	99	244	169	138	307	145	113	258	4	6	10
Total	210	135	345	272	201	473	277	236	513	204	168	372	9	12	21

*School 2, sixteen-year group, reduced to grade at fourteen years.

be directly compared in school grade attainment. In selecting sixteen-year-old children from the high school, we found it impossible to secure a school-grade distribution which corresponded closely to that of children selected at fourteen from elementary schools. The X_2 series contains a larger proportion of children who, when reduced to a fourteen-year basis, belong in the seventh and eighth grades, and a smaller proportion who belong in fifth or sixth grade, than X_1 series. Of 760 children in the X_1 series, 362, or 48 per cent, were from the two lower grades, while of 211 X_2 children only 34, or 16 per cent, belonged in the two lower grades (see Table 2).

Even with the addition of the X_2 series, we had but 152 school children, or 15–16 per cent, left in school at eighteen years out of a total of 971 individuals, of whom 760 were first tested at fourteen years and 211 at sixteen years. The complete details with regard to rate of loss each year in the X_1, X_2, and M series, from each of the five grades are shown in Table 3. It is interesting to note that of 152 school children tested at fourteen years from the level of the fifth grade, only one remained in school up to eighteen years, while of 177 tested at fourteen from the level of the eighth grade, 52 were in school at eighteen years. The table also shows that of the 152 children remaining in school at eighteen years, 68 were drawn from the 760 first examined at fourteen years, and 84 from the 211 first examined at sixteen years.

The X_2 series differed from the X_1 series not only in educational attainment, but in social and economic conditions (see Chapter XII). They came from a school situated in a good residence district, whereas the X_1 children came from industrial districts.

In one other important respect, the two groups were not so closely comparable as we should have liked to have them. All of our school children were from public schools, whereas a large proportion of our working children were from parochial schools (2). The task of securing the type of coöperation necessary in this experiment from parochial schools was too difficult for us. During the early years of our study there was no superintendent of parochial schools in Cincinnati, and therefore little uniformity in policy. It was necessary to send the children to the laboratory for the tests. To secure this coöperation separately from each parochial school was more of a task than we could accomplish. Furthermore, the number of parochial school children who, at that time, remained in school up to eighteen years of age was too small to make the group worth while for us as a basis of comparison with working children.

NUMBER OF CASES

The number of cases represented in the two series at each of the five ages is presented in Table 4, derived from Table 3.

TABLE 3

TABLE OF NUMBER OF CASES BY AGE, GRADE, AND SEX

Boys

Grade	14			15			16					17					18					Total 14-18 Years		
	X	M	X&M	X	M	X&M	X_1	X_2	$X_{1,2}$	M	X&M	X_1	X_2	$X_{1,2}$	M	X&M	X_1	X_2	$X_{1,2}$	M	X&M	X	M	X&M
V	86	124	210	51	116	167	15	0	15	99	114	6	0	6	89	95	1	0	1	90	91	159	518	677
VI	111	127	238	68	115	183	27	34	61	107	168	15	20	35	90	125	5	12	17	83	100	292	522	814
VII	119	108	227	78	105	183	47	50	97	87	184	25	32	57	80	137	12	22	34	82	116	385	462	847
VIII	112	64	176	99	57	156	82	37	119	56	175	48	31	79	52	131	11	5	16	50	66	425	279	704
IX																								
Total . .	428	423	851	296	393	689	171	121	292	349	641	94	83	177	311	488	29	39	68	305	373	1261	1781	3042

Girls

Grade	14			15			16					17					18					Total 14-18 Years		
	X	M	X&M	X	M	X&M	X_1	X_2	$X_{1,2}$	M	X&M	X_1	X_2	$X_{1,2}$	M	X&M	X_1	X_2	$X_{1,2}$	M	X&M	X	M	X&M
V	66	69	135	41	60	101	21	0	21	61	82	2	0	2	45	47	0	0	0	38	38	130	273	403
VI	99	102	201	80	90	170	33	0	33	91	124	13	0	13	77	90	2	0	2	57	59	227	417	644
VII	102	98	200	77	87	164	44	36	80	89	169	22	32	54	81	135	16	30	46	71	117	359	426	785
VIII	65	61	126	58	50	108	53	54	107	54	161	45	49	94	44	138	21	15	36	40	76	360	249	609
IX																								
Total . .	332	330	662	256	287	543	151	90	241	295	536	82	81	163	247	410	39	45	84	206	290	1076	1365	2441

Total — Boys and Girls

Grade	14			15			16					17					18					Total 14-18 Years		
	X	M	X&M	X	M	X&M	X_1	X_2	$X_{1,2}$	M	X&M	X_1	X_2	$X_{1,2}$	M	X&M	X_1	X_2	$X_{1,2}$	M	X&M	X	M	X&M
V	152	193	345	92	176	268	36	0	36	160	196	8	0	8	134	142	1	0	1	128	129	289	791	1080
VI	210	229	439	148	205	353	60	34	94	198	292	28	20	48	167	215	7	12	19	140	159	519	939	1458
VII	221	206	427	155	192	347	91	86	177	176	353	47	64	111	161	272	28	52	80	153	233	744	888	1632
VIII	177	125	302	157	107	264	135	91	226	110	336	93	80	173	96	269	32	20	52	90	142	785	528	1313
IX																								
Total . .	760	753	1513	552	680	1232	322	211	533	644	1177	176	164	340	558	898	68	84	152	511	663	2337	3146	5483

TABLE 4

TOTAL NUMBER OF CASES BY AGE, SEX, AND SERIES*

	14 YEARS			15 YEARS			16 YEARS				17 YEARS				18 YEARS			
	X	M	X&M	X	M	X&M	X_1	X_2	M	X&M	X_1	X_2	M	X&M	X_1	X_2	M	X&M
Boys . . .	428	423	851	296	393	689	171	121	349	641	94	83	311	488	29	39	305	373
Girls . . .	332	330	662	256	287	543	151	90	295	536	82	81	247	410	39	45	206	290
Total . .	760	753	1513	552	680	1232	322	211	644	1177	176	164	558	898	68	84	511	663

*X_1 original school series.
X_2 school series added at 16 years.

Ages of the Two Groups

Although an attempt was made to make the ages of the school and working groups correspond as closely as possible, it was not entirely successful. Since it was legal for children who had completed the fifth grade to leave school on the fourteenth birthday, we found our fourteen-year-old working children grouped near the fourteenth birthday. The school children, for whom no such selective factor was involved, were distributed more evenly through the months between fourteen and fifteen, in spite of a preference given to those near the fourteenth birthday. Table 5 shows the median age in years and months of the working and school groups at the time of the successive annual tests.

TABLE 5

AGE MEDIANS

Boys

Series	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
Working	1.5 mo.	1.4 mo.	0.8 mo.	2.6 mo.	2.2 mo.
School	4.6	4.4	5.1	4.7	4.0

Girls

Series	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
Working	1.9	1.8	1.4	3.0	3.6
School	4.2	4.7	5.2	5.5	3.9

In reëxamining the children from year to year, every effort was made to secure the reëxamination at an interval very close to a year. The rule was that the test must be made within a month, before or after, the exact year. With a few exceptions, in the older years, this rule was adhered to. When all four of the yearly intervals are taken into consideration, the median interval between tests was 11.8 months for the school boys; 11.7 months for the school girls; 11.8 months for the working boys; and 11.9 months for the working girls. For the entire group, the interval was 11.8 months.

The Follow-up Work of the Investigation

In the case of the children who remained in the public schools, the method of securing reëxaminations from year to year was simple. The Superintendent of Schools requested the principals of the schools to send us the children at request. The difficulty was to persuade the school to work out a systematic method of sending in the required number day after day. It was a difficult task, somewhat disturbing to the daily routine of the schools. Very frequently the expected children did not arrive because some one had forgotten to notify them, and the day set aside for experimental work had to be devoted to some other purpose. There were more failures to meet engagements on the part of school children than on the part of working children, though it was rarely the fault of the children. The schools differed very much among themselves in their reliability about keeping appointments. Some of them rarely failed, and others had to be reminded of the appointments each morning.

In the case of the working children, the task of making the appointments was far more difficult, though the appointments were more reliably kept when made. We began the campaign by sending a letter to each child when the time for the re-test approached. Each child had been told at the time of the previous test that we would ask him to come back for a re-examination at the end of the year. Every effort was made to secure the interest of the children in the tests and to explain why we were interested in making them. The letter asking for an appointment offered to pay the child's car fare, and to pay him whatever he would lose in wages by coming for the test. Since many of these children were piece-workers in factories, and since some of the time-workers were docked by their employers for absence, this precaution was necessary. In addition to writing to the child, the employer was called up and asked to coöperate by sending the child in. Up to the age of sixteen, all of these children were working under certificates issued by our office. Accordingly when we called up and asked to have a child sent in to the office in order that we might complete some of his records, the employer usually did so without question. Some of them understood what we were doing and were interested. Others merely complied with a request. If neither the letter nor a request to the employer secured the desired result, a home visit was our next resort. Sometimes several home visits were necessary.

Our quasi-legal hold over the children lasted up to the age of sixteen for boys and to eighteen for girls. A change in the state employment-certificate law in 1913 increased the required age for certificates for girls to eighteen years. The new law was so drawn that enforcement was difficult, but it was of assistance to us in securing reëxaminations. It was easier to secure coöperation on a purely voluntary basis from boys than from girls. They seemed to be more venturesome and less sensitive and suspicious. If it had not been for the assistance of the law, we would doubtless have been less successful than we were with girls over sixteen.

Extent to Which Cases Thus Selected Can Be Taken as Representative of the Community-at-Large

The method of selection of the cases and the size of the two groups of working and school children were such as to make us feel satisfied that we had fair samplings of the working and of the school populations of native-born white children. The doubtful point is whether combining the two groups in the proportions used in this study gives a total group which represents the community as a whole. To be sure of this, we should have to know that the relative number of working and of school children at each age is the same as that found in the community. Nor is this proportion itself a fixed quantity. In years in which positions in industry are plentiful, more children of a given age will be found in industry and fewer in schools than in years when positions are hard to get. The state law is drawn in such a way that up to a given age (now eighteen years, but at the time of this study sixteen years) children are legally required to be either at work or in school. The number entering industry in a year in Cincinnati has in times of industrial depression fallen as low as 1000, whereas in other years, under the same legal conditions, it has been as high as 3000.

The following statistics, imperfect as they are, will give a general idea of the extent to which our series is to be taken as representative of the whole community.

School statistics of attendance are kept in such a form that the number of children in each grade each year can be easily found from the reports of the Superintendent. The number in each grade who fail of promotion each year is also recorded. By subtracting the repeaters from the total first-grade enrollment it is possible to find the number of children who enter first grade each year. Census figures show that between the ages of six and eighteen years loss from death is a comparatively small factor. For a rough computation one can assume that the number of new entrants to first grade, if there were no failures in promotion and no losses from leaving school, would be approximately the number found in each grade from the first to the twelfth. The proportion of this basic number found in each grade each year can be taken as indicating the proportion of children remaining in school. The computation has been made for Cincinnati, using averages for five years as a basis. The figures run as follows:

At the close of Grade VIII, 57 per cent remain, 43 per cent have left.
At the close of Grade IX, 38 per cent remain, 62 per cent have left.
At the close of Grade X, 23 per cent remain, 77 per cent have left.
At the close of Grade XI, 15 per cent remain, 85 per cent have left.

Our results can best be compared with this series on the basis of age. The close of the eighth grade is comparable to our fifteen-year-old series. The proportion of school and working children is as follows:

At 15 years, 45 per cent school children, 55 per cent working children
At 16 years, 45 per cent school children, 55 per cent working children
At 17 years, 38 per cent school children, 62 per cent working children
At 18 years, 23 per cent school children, 77 per cent working children

The results of this rough comparison suggest that at fourteen and fifteen our total series is somewhat overweighted with working children, and at sixteen, seventeen, and eighteen years, somewhat overweighted with school children. We cannot claim, therefore, that the scales of measurement derived from these series represent the entire community in the sense that its distribution of cases can be shown to correspond exactly to that of the whole community. However, except for the army tests of enlisted men, there are no other scales that come as close to representing a community as this one. So far, scales for adolescents have been based almost entirely on children who remain in school—a selected group.

Scope of Investigation

In planning the investigation of working children, Miss Campbell and Mr. Clopper desired to make it as comprehensive as possible. They wished to include the phases of health, mental and physical measurements, education, social conditions, and industrial life. To insure the systematic recording of data, a set of schedules covering these phases was made out. They are reproduced here.

Not all of the data represented on these forms has been summed up and analyzed. Exactly what has been done will appear as the various topics are discussed in detail. Only a few general points will be discussed here.

The greatest defect of the whole procedure is that it included no medical service. Each child who took out an employment certificate was examined by a school physician, and a report of that examination was part of our office record. However, at that time the medical examinations were mere cursory inspections. Not more than sixty of the two thousand or more cases a year were reported as having physical defects. Our lay inspectors discovered a much larger proportion of very obvious ones. Aside from these medical inspections at the time of the issuance of the first certificate, no medical service was available. The physical schedule (II) was filled out by the psychological laboratory assistants and has only the value of the observations of an intelligent lay worker whose training touched that of the medical profession at some points. The only entries on Schedule II which have been summed up in the present study are height, weight, and vital capacity.

Schedule I was made out at the office at the time of the first test. The information on it, except for that with regard to school grade and rating in school subjects, represents only the child's statements. On most of the points included in this form, a fourteen-year-old child is at least as accurate as the adults in the family.

The psychological schedule (III) does not contain entry spaces for all the tests used. The form of the blank was changed several times during the course of the investigation, as the selection of tests was modified. Tests for which no space appears on the face of the card were recorded on the back of it. The card was not fully filled out at the time of the test. Most

STUDY OF CINCINNATI WORKING CHILD

SCHEDULE I.

NAME
ADDRESS

AGE
DATE OF BIRTH BIRTH-PLACE

CREED
NAME OF PASTOR OR PRIEST

OCCUPATION: [A] FATHER [B] MOTHER

SCHOOL ATTENDED GRADE
LAST DAY

STANDING:
READING SPELLING WRITING ENG. GRAMMAR GEOGRAPHY ARITHMETIC

SCHOOL ATTENDANCE RECORD

SPECIAL TRAINING
MANUAL DOMESTIC SCIENCE

CONDUCT IF TROUBLESOME, STATE REASON

APPLICATION PUNCTUALITY

REMARKS:

SOURCE—AGE AND SCHOOLING CERTIFICATE RECORDS.

SCHEDULE I—(reverse)

WHAT SCHOOLS HAVE YOU ATTENDED?

WHAT STUDIES DID YOU LIKE BEST? LEAST?

WERE YOU ABSENT MUCH? IF SO, WHY

WHY HAVE YOU LEFT SCHOOL?

WORK BEFORE AGE OF FOURTEEN? AGE

BEFORE SCHOOL AFTER SCHOOL ERRAND

SELLING PAPERS PEDDLING BOOT-BLACKING OTHER EARNINGS

WHY ARE YOU GOING TO WORK?

1 a FATHER'S BIRTHPLACE AND RACE b SAME FOR MOTHER

2 a LANGUAGES SPOKEN BY FATHER b SAME FOR MOTHER

3 LANGUAGE OF HOME

4 a MOTHER A WAGE EARNER AT HOME? b OUTSIDE OF THE HOME?

5 NO. OF ROOMS OCCUPIED BY FAMILY

6 LODGERS?

SOURCE—THE CHILD

PHYSICAL EXAMINATION

SCHEDULE II.

NAME NUMBER SEX HEIGHT WEIGHT

FAMILY HISTORY

NUMBER OF OTHER CHILDREN NO OF CHILD

MOTHER'S CONDITION

FATHER'S CONDITION RHEUMATISM CANCER

TUBERCULOSIS SYPHILIS HEART DISEASE

PERSONAL HISTORY

MUMPS MEASLES WHOOPING COUGH SCARLET

DIPHTHERIA TYPHOID PNEUMONIA

HEALTH DURING PAST YEAR

PRESENT CONDITION

EARACHE HEADACHE EYES COUGH

EXPECTORATION NIGHT SWEATS SORE THROAT APPETITE

FATIGUE COLOR

EXAMINATION

TONSILS ADENOIDS GLERVICAL GLANDS

THYROID GLAND TEETH MUCOUS MEMBRANES GUMS

CHEST LUNGS INSPIRATION EXPIRATION EXCURSION

VITAL CAPACITY HEART PULSE RATE RYTHM TEMPERATURE

SPINE FOSTURE FEET SKIN RASH

SCHEDULE III. PSYCHOLOGICAL * STUDY OF CINCINNATI WORKING CHILD

NO. SCHOOL GRADE NAME

YERXES PT. SCALE	NO. PTS. ____ AGE ____	VIS. AC.	R. E. ____ L. E. ____	AUD.	R. EAR ____ L. EAR ____	GRIP	RIGHT ____ LEFT ____

TAPPING

RIGHT				LEFT				____ BOX
SECONDS	TAPS	SECONDS	TAPS	SECONDS	TAPS	SECONDS	TAPS	
1 - 15		1 - 30		1 - 15		1 - 30		
15 - 30		30 - 60		15 - 30		30 - 60		
30 - 45		1 - 60		30 - 45		1 - 60		
45 - 60		FATIGUE INDEX		45 - 60		FATIGUE INDEX		

SUBSTITUTION

SECTION	1	2	3	4
TIME				
ACC.				
INDEX				

MEMORY

SERIES	7 PLACE	8 PLACE	9 PLACE	10 PLACE
1				
2				
AV.				
SPAN				

STEADINESS

HAND	RIGHT	LEFT		A TEST		OPPOSITES	
HOLE					TIME		TIME
CONTACTS					ACC.		ACC
					INDEX		INDEX

CARD SORTING

TIME	ERRORS
ACC.	
INDEX	

FORM BOARDS

CHICK OR CRADLE	TIME	BOAT OR SEAL	TIME
	MOVES		MOVES
	IMP.		IMP

RECOGNITION TEXT

+ ERRORS

— ERRORS

% CORRECT

MULTILATED TEXT (FORM)	NO. DONE
	% CORRECT
	INDEX

AUSSAGE TEXT	NO. WORDS	CHANGES IN
	CORRECT IDEAS	ORDER
	ADDITIONS ____	INDEX ____
GRAMMATICAL ERRORS		
		DATE

HARD INSTRUCTIONS TEST

NO. DONE	TIME
NO CORRECT	
ADDITIONS	INDEX
OBSERVER	

* Form used at eighteen years. The forms at other years were similar with minor changes corresponding to changes in tests.

STUDY OF CINCINNATI WORKING CHILD

INDUSTRIAL HISTORY

SCHEDULE IV

No. Name

JOBS	DATE OF		USE OF UN-EMPLOYED TIME	INDUSTRY	KIND OF WORK
	TAKING	LEAVING			
1					
2					
3					
4					

	HOURS	OVERTIME	EARNINGS			HOW FOUND	CHILDS REASON FOR LEAVING	EMPLOYERS REASON FOR LEAVING
			TIME	PIECE	WEEKLY			
1								
2								
3								
4								

SCHEDULE IV—(reverse)

JOBS	1	2	3	4
1 EASE OF FINDING				
2 FATIGUE a				
b				
3 EARNINGS a				
b				
4 APPRENTICE a				
b				
5 CONTINUATION OF EDUCATION				
6 RELATION OF STUDIES TO WORK				
7 ENJOYMENT OF WORK				
8 FREE TIME				
9 WORK AND SCHOOL a				
b				
10 COMBINATION OF WORK & SCHOOL				

RECORD OF HOME VISIT
SCHEDULE V

STUDY OF CINCINNATI WORKING CHILD

NAME ADDRESS No.

NEIGHBORHOOD:
GENERAL CHARACTER RESIDENCE OR INDUSTRIAL NATIONALITY

HOME: S. T.
TYPE OF BUILDING CONDITION OF BUILDING PREMISES TOILET

NO. OF ROOMS FLOOR FRONT OR REAR LIGHT VENTILATION WATER LOCATION

ORDER CLEANLINESS FURNISHINGS

FAMILY: CH.
OWN OR GUARDIAN TOTAL NO. IN HOME FAMILY AT HOME BOARDERS LODGERS MARRIED OR AWAY DEAD

HEALTH RECORD CAUSE OF DEATH

M.
NATIONALITY REMARKS

WAGE EARNERS	KIND OF WORK	WEEKLY EARNINGS	AM'T KEPT FOR SELF	UNEMPLOYMENT	EXPENSES
					RENT Month
					FOOD Week LUNCHE
					INSURANCE
					INSTRUCTION SAVINGS

CHILD:
HOME RESPONSIBILITY USE OF SPARE TIME TRADE AMBITION

PARENTS' REASON WHY CHILD STOPPED SCHOOL SPECIAL SCHOOL USE OF EARNINGS

PARENTS' ATTITUDE TOWARDS CHILD'S EDUCATION 1-A 2-B 3-C 4-D 5 CHILD'S WORK 1 2 3 A-B X-Y

PARENTS' ATTITUDE TOWARDS CHILD 1-A 2-B 3-C 4-D 5-E 6-F

GENERAL IMPRESSION OF HOME

DATE INVESTIGATOR SOURCE OF INFORMATION

OVER

SCHEDULE V—(reverse)

REMARKS:

PERSONALITY RECORD

SCHEDULE VI

No. .... Name ________________________ Date ....

1. Vocational Outlook

a

b

c

2. General appearance

a

b

c

d

3. Neatness

a

h

c

d

e

f

g

4. Socially Pleasant

a

b

c

d

e

f

g

SCHEDULE VI—(reverse)

5. Self Reliance and Assertiveness.

a

b

c

d

6. Scope of Interest.

a

b

c

1

2

3

4

7. Conclusions and other remarks

KEY TO PERSONALITY CARD

(Schedule VI)

1. Vocational outlook.
    - a. Best position hoped for. Estimated time it will take to reach it.
    - b. Contentment with the prospect.
    - c. Reasons for choice.

2. General appearance.
    - a. Size—height and weight.
    - b. Skin, complexion, nutrition.
    - c. General attractiveness and facial expression.
    - d. Noticeable defects.

3. Neatness.
    - a. Skin.
    - b. Hair.
    - c. Hands.
    - d. Clothes—cleanliness and manner of wearing.
    - e. Condition of clothes as to age and previous condition of servitude.
    - f. Suitability of clothes to the occasion.
    - g. Attention paid to care of clothes.

4. Socially pleasant.
    - a. Voice.
    - b. Manner.
    - c. Initiative in conversation. Freedom or diffidence.
    - d. Unpleasant mannerisms.
    - e. Friendly or unfriendly attitude toward interview.
    - f. Social ease. Willingness to give information.
    - g. Use of English.

5. Self reliance and assertiveness.
    - a. Evidence of planning.
    - b. Suggestibility—positive or negative.
    - c. Social leadership.
    - d. Degree of desire for improvement.

6. Scope of interests.
    - a. General information. Range and character. Sources.
    - b. Interest in further education.
    - c. Knowledge about and interest in the following topics:
        1. Unions.
        2. Municipal ownership.
        3. Child labor under 16 years.
        4. Compulsory education.

of the original recording was done on separate sheets of paper. The evaluating of many of the tests had to be done later. Records were transferred to the card at the time that the evaluating was done. Methods of conducting tests and of dealing with the data obtained are exhaustively discussed in later chapters. All that need be taken up here is the question of the training of the laboratory assistants and methods of establishing personal contacts with the children. Aside from the director, the laboratory assistants were not holders of higher degrees in psychology. They were university graduates, who had had some training in psychology beyond elementary work. Several of them had had a year or two of graduate work. The director made herself personally responsible for training each assistant in the giving and evaluating of the series of tests used; and not until the director was confident of the accuracy and facility of a new assistant was he allowed to examine children. The director, who herself worked in the laboratory, kept the assistants under observation and held frequent conferences on details of method. The uniformity in actual procedure which was thus secured was of a high order.

Uniformity of skill in making personal contacts was more difficult to secure. The importance of peace of mind and a friendly attitude on the part of the child was emphasized in the discussions of the laboratory. Each experimenter talked with the child before beginning the series of tests, about his school, his home, and his prospects of work. The information of Schedule I was secured at this time. Each child was told that the securing of his employment certificate was in no way dependent upon his standing in the tests. Every attempt was made to make the child feel the friendly interest of the office and to prepare him for a continued interest from year to year. There were few cases in which we had any reason to think that a disturbed mental state interfered with the results of experimentation and those few were excluded from summaries of results.

The industrial histories were recorded at the time of a change of position and when the child returned to the laboratory for the annual test. Children who had been tested were indicated in the employment-certificate office in such a way that when one of them came in for a change of position, the secretary could identify him and refer him to the psychological laboratory. It was the laboratory assistant who questioned him about his past employment and recorded the facts. Only the children in the working group were studied from the point of view of industrial history. It would have been very desirable to keep industrial records of the children in our school group as they left school and entered industry, but it was not possible, with the staff at our command, to undertake it.

The home visits were made by a staff different from that of the laboratory. It is of course impossible because of its effect on the family being visited to fill out a schedule at the time of the visits. Some notes could be made during the visit without giving offense, but the visitor had to depend upon her memory for the rest and fill out the card as soon as possible afterward. Needless to say it was not possible to get all of the information represented on the schedule for every family.

The facts recorded on the home-visiting schedule were summed up in a numerical scale of home rating whose construction is explained in Chapter XIII. Schedule VI, in which there is an attempt to record personality, was made out at the time of the fifth and last laboratory examination or in follow-up interviews after that time. It has been used in this study only in the interpretation of special groups where it seemed possible to take personality factors into consideration. No attempt at a general summary of its content has as yet been made.

Treatment of Results

In summing up the results of various tests, a system was adopted which made it possible to be sure that every individual was accounted for in each summary and that all entries made in summaries could be identified. The records of all measurements were first copied on large sheets in chronological order. All of the records of a given measurement thus fell in one column on these rough sheets. The next step was to make out what was called a key sheet, in which a school-grade division for boys and girls separately served as the form of classification, and each child of the entire series was recorded by case number in his correct place on the table. In summing up any given measure, a summary sheet was prepared in which the sex and school-grade classification appeared across the top of the sheet, and the steps decided upon for the distribution table down the side of the sheet. Beginning with the key sheet, each school-grade division was then distributed on the summary sheet, making the entries by writing case numbers in the correct position on the sheet. Thus each individual entry could be checked for correctness, and the entire group could be checked by means of the key sheet. Omissions were recorded in a division of the summary sheet. Distribution tables by sex and school grade were then made out directly from the summary sheets. In making out percentile scales, the school-grade subdivisions were disregarded and a distribution table formed for all of each sex, in which the steps correspond with the distribution on the summary sheet. No rule could be adopted for deciding upon the steps in a distribution table. The nature of the measure and the observed distribution on the rough sheets were our guides. Since the distribution tables as well as the percentile scales are published, the reader can see what the decision was in each case.

The percentile tables are so arranged that in every instance the value of the percentile indicates the upper limit of the group to which it refers. For instance, the five percentile is the upper limit of the poorest 5 per cent in any given measure. Any individual whose record fell at or below this point would be given a percentile rank of five. To illustrate the point, turn to the percentile scale of height for fourteen-year-old boys (see Chapter III, Table 6). The five-percentile point on the scale is 141.1 cm. Accordingly any fourteen-year-old boy whose height was 141.1 cm. or less was given a percentile rank of five in height. Any boy whose height was greater than 141.1 cm. but not more than 143.8 cm. was given a percentile rank of ten. At the upper end of the scale, any value greater than the ninety-fifth percentile was given a rank of one hundred. For instance, any fourteen-year-old boy with a height greater than 166.9 cm. was given a rank of one hundred. The scales are in every instance arranged so that the lower end of the scale represents the poor record and the upper end the good records. In some cases the numerical values are thus reversed and the large numbers are found at the lower end of the scale while the small numbers are at the upper end. This is true in any case in which a large number represents a poor record; for instance, time in card-sorting, or index in substitution.

Wherever it has been possible, the percentile method of summing up results has been used. It has been consistently applied to mental and physical measurements, and has been used for factors of the industrial history to which it was suited. Our interest in making the study was not so much to obtain absolute measures of individuals as to get the distribution of abilities in the community, and to be able to fix the approximate status of the individual with reference to those of his own age and sex. The percentile method of summarizing results seemed best suited to this purpose. Percentile scales of each measurement to be summarized, with ten divisions each, were first made for working children and school children separately. These scales furnish the basis of comparison for working and school children. Exactly the same methods of summary were followed for the two groups. Since the distribution tables contained the same steps for working and for school children, it was a comparatively simple matter to combine the two in the case of any given measurement into one group, by adding the two distribution tables, step by step. In the combined scale, which was to be used for grading individuals, it seemed worth while to have finer subdivisions. Accordingly these scales have twenty subdivisions instead of ten. We call them five-percentile scales, since each subdivision represents 5 per cent of the series.

For many of the purposes of this investigation, it seemed to us desirable to have a single measure for mental abilities and a single one for physical abilities. The best method of securing it, given five-percentile scales of each separate measurement, seemed to be to find the percentile ranks of a given individual in each one of his mental tests and in each one of his physical tests by referring his score to the five-percentile scale; and then to take an average of all his percentile ranks in physical tests and another of all his percentile ranks in mental tests. In outline, this is the procedure followed. Since some tests had several measures and others only one, and since some tests seemed to be of more value than others, decisions as to just how to include each test and what weight to give it in taking an average were necessary. These details are discussed in later chapters.

Finally, a word needs to be said about the lack of bibliography. A complete bibliography covering all aspects of a study like this, and including related material, would be as large as the book. On the other hand there are few outstanding contributions which need to be mentioned. Since it has been impossible, from the point of view of time or effort, to prepare an exhaustive bibliography and compare the content of this study adequately with other data and other theories, the writer has confined herself to stating the outcome of the present piece of research and the conclusions which it seems fair to base upon it. The only bibliographical references are those to works to which it has been necessary to refer, for one reason or another, or to bibliographies already prepared covering one phase or another of the study. They appear appended to each chapter. In the body of the text these publications are indicated by numbers in parentheses to correspond with the numbering of the references at the end of the chapter.

References

(1) *Eighty-third Annual Report of the Superintendent of Schools of Cincinnati*, year ending August 31, 1912. Public Schools, Cincinnati, 1912.

(2) WOOLLEY, HELEN THOMPSON and FISCHER, CHARLOTTE RUST—"Mental and Physical Measurements of Working Children," *Psychological Monographs*, 1914, No. 77. Psychological Review Publishing Co., Princeton, N. J.

CHAPTER III

THE SCALE OF PHYSICAL MEASUREMENTS

In the present chapter we shall present the results of physical measurements for the entire group of children of each age, regardless of whether they are at work or in school. The detailed comparison, by industrial and school groups, by ages, by sexes, and by educational status, will be taken up in later chapters. Our hope now is to present the total outcome in as condensed a form as possible for those who wish to use the results as a standard of measurement. We shall first discuss each physical measurement made, presenting the result in the form of a percentile scale of twenty divisions, and then give the results of a general scale of physical ability, in which all of the tests involving skill are combined in a common measure. The measurements discussed in this chapter are those of height, weight, vital capacity, strength of the hand, steadiness of the hand, rapidity of motion in a tapping test, and card-sorting. All of these tests were used at each of the five annual examinations, from year fourteen to year eighteen inclusive. Accordingly the average scale of physical ability is made up of the same elements each year.

Height

(1, 2)

Measurements of height were taken with a measuring rod mounted on a standard and furnished with a sliding arm. Readings were recorded in centimeters and millimeters. The height was taken without removing the shoes, but in each case the height of the heel was measured with a vernier and subtracted from the total height before it was recorded. Girls who wore braids or combs on the top of the head were required to remove them while the measurement was being taken. Each child was asked to stand as straight as possible on the platform of the instrument, with his back against the rod. When the position was satisfactory, the sliding arm was lowered until it touched the top of the head. The reading less the height of the heel was recorded in centimeters.

The heights of boys and girls separately are presented in the following percentile scales, made with five-percentile divisions (Tables 6 and 7).

Weight

(1, 2)

Measurements of weight were taken with a standard scale and recorded in kilograms and twentieths of kilograms. Weights were taken with the children clothed. The office had, at the start, no facilities for taking a stripped weight. Our quarters did not permit of separate dressing rooms, nor was the staff sufficiently well supplied with men and women to see to it that the girls were always examined by women and the boys by men. Had we had the facilities, we should scarcely have dared face the opposition which a stripped weighing would have aroused in the community at large. All weights were taken without wraps, and in the case of the boys without coats. Since the weights of the same individual were taken at intervals of about a year, the clothing was that of the same season each time.

The weights of boys and girls separately are presented in the following scales, made with five-percentile divisions (Tables 8 and 9).

TABLE 6 — HEIGHT IN CENTIMETERS

Boys

PERCENTILES	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	141.1	146.1	152.2	159.5	160.8
10	143.8	149.0	155.7	161.3	163.1
15	145.2	150.9	157.6	163.2	164.5
20	146.6	152.5	159.3	164.2	165.7
25	147.8	154.0	160.5	165.1	166.9
30	148.9	155.5	161.6	166.0	167.9
35	149.9	156.6	162.8	166.9	168.6
40	150.9	157.6	163.8	167.7	169.3
45	151.9	158.7	164.7	168.5	170.1
50	152.9	159.7	165.5	169.4	170.8
55	153.9	160.8	166.5	170.2	171.6
60	154.8	161.9	167.4	171.1	172.5
65	155.9	163.0	168.5	171.9	173.3
70	157.2	164.2	169.6	172.9	174.2
75	158.5	165.5	170.7	173.8	175.1
80	159.9	166.9	172.0	174.7	176.2
85	161.7	168.5	173.5	175.8	177.6
90	163.4	170.4	175.2	177.7	178.9
95	166.9	173.9	178.1	179.6	181.8
No. of Cases . .	850	682	630	485	353
Median	152.9 ± .23 P. E.	159.7 ± .28 P. E.	165.5 ± .25 P. E.	169.4 ± .25 P. E.	170.8 ± .28 P. E.
Q	5.4	5.8	5.1	4.4	4.1

Vital Capacity

(1, 2)

Vital capacity was measured with a wet spirometer reading tenths of a liter. The spaces on the scale were large enough to be read in halves or quarters. Accordingly the readings may be regarded as cubic centimeters on a scale whose smallest subdivisions indicate 25 cc. In taking the measurement, the child was first told to throw his shoulders back, take as deep a breath as he could through his nose, and blow it out through his mouth. He was then instructed as follows:

"This instrument is to measure how well you can breathe—how good a pair of lungs you have. I will show you how to do it. First I put this

TABLE 7 — HEIGHT IN CENTIMETERS

Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	144.4	148.1	149.5	151.7	151.9
10	147.0	150.1	152.1	153.3	153.6
15	148.4	151.7	153.5	154.8	155.3
20	149.5	152.6	155.0	156.0	156.3
25	150.6	153.6	156.0	156.7	157.3
30	151.6	154.5	156.5	157.5	158.2
35	152.6	155.4	157.5	158.3	159.1
40	153.3	156.1	158.3	159.1	159.9
45	154.0	156.8	159.1	159.9	160.6
50	154.9	157.5	159.8	160.6	161.3
55	155.8	158.2	160.5	161.4	161.9
60	156.6	158.9	161.2	162.1	162.6
65	157.4	159.6	162.0	162.9	163.3
70	158.2	160.7	162.7	163.7	164.2
75	159.0	161.8	163.4	164.7	165.2
80	160.0	162.8	164.6	165.7	166.2
85	161.3	164.1	165.9	166.7	167.3
90	162.6	165.6	167.1	168.0	168.9
95	164.8	167.1	169.8	170.4	170.8
No. of Cases . .	662	536	524	399	232
Median	154.9± .20 P. E.	157.5± .21 P. E.	159.8± .19 P. E.	160.6± .25 P. E.	161.3± .32 P. E.
Q	4.2	4.1	3.7	4.0	4.0

mouthpiece into my mouth, close my lips tight around it, and then breathe in all the air I can through my nose. Then I blow it all out through this tube, and see how high I can make the can go. [The experimenter does it.] Now you try it [putting in a new wooden mouthpiece]. Breathe in every bit of air you can, and force it all out. Blow hard, but not too fast."

The child then tried it, while the experimenter watched and criticized the result. Many children of fourteen, particularly those who have had no gymnastic training, find it very difficult to carry out the instructions. They seem to be lacking in sufficient control of their bodies to perform the test. Some children are unable to breathe in air through the nose. In such cases, the experimenter allowed the child to breathe in air through

TABLE 8 — WEIGHT IN KILOGRAMS

Boys

PERCENTILES	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	31.7	35.7	40.3	46.5	48.9
10	34.1	38.5	43.5	49.2	52.3
15	35.4	40.2	45.8	51.3	53.8
20	36.7	41.9	47.3	52.7	54.7
25	37.8	43.0	48.6	53.7	55.6
30	38.7	44.2	50.0	54.6	56.5
35	39.6	45.4	51.1	55.3	57.4
40	40.4	46.5	52.3	56.1	58.3
45	41.3	47.6	53.4	57.0	59.0
50	42.1	48.7	54.5	57.8	59.7
55	43.1	49.8	55.5	58.4	60.6
60	44.1	51.0	56.5	59.6	61.5
65	45.1	52.1	57.6	60.4	62.4
70	46.1	53.2	58.6	61.3	63.3
75	47.5	54.3	59.7	62.2	64.3
80	48.9	55.4	61.2	63.6	65.8
85	50.7	56.4	63.1	64.9	67.0
90	53.5	57.5	64.9	66.3	68.4
95	56.7	62.1	68.4	68.7	70.6
No. of Cases . .	849	681	630	483	349
Median	42.1±.21 P. E	48.7±.27 P. E.	54.5±.28 P. E.	57.8±.25 P. E.	59.7±.29 P. E.
Q	4.9	5.7	5.6	4.3	4.4

the mouth, and gave several practice trials before taking readings. When he thought the child was performing the test as well as he could, he took three readings and recorded the best of the three. Some of the very low records, however, are undoubtedly due to the fact that within the very limited time possible for practice some children were unable to learn to perform the test correctly. The extreme awkwardness with which some of the children, even in the final trials, managed their breathing, was evidence enough that the wet spirometer is not a pure measure of lung capacity.

The results are presented in the following five-percentile scales for boys and girls separately (Tables 10 and 11). In taking the average percentile rank for the individual, the percentile rank for vital capacity is used as one of the seven measures.

TABLE 9 — WEIGHT IN KILOGRAMS

Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	34.6	38.6	40.9	44.9	43.4
10	36.7	41.0	43.2	46.0	45.4
15	38.4	42.7	45.0	47.0	46.6
20	39.6	43.9	46.4	48.1	47.7
25	40.8	45.1	47.3	48.9	48.7
30	41.9	46.2	48.2	49.8	49.7
35	42.8	47.0	49.1	50.8	50.6
40	43.7	47.7	50.0	51.7	51.5
45	44.5	48.5	50.8	52.4	52.3
50	45.4	49.3	51.7	53.2	53.2
55	46.3	50.0	52.6	53.9	54.0
60	47.1	51.0	53.5	54.9	54.9
65	48.0	51.9	54.5	55.8	55.6
70	48.9	52.9	55.7	57.0	56.4
75	49.7	53.8	57.0	58.2	57.3
80	51.2	55.1	58.2	59.5	58.4
85	52.7	56.3	59.5	61.0	60.4
90	54.7	57.6	62.3	63.0	62.7
95	57.5	64.2	66.7	67.5	69.0
No. of Cases . .	662	537	529	399	228
Median	45.4± .21 P. E.	49.3± .23 P. E.	51.7± .26 P. E.	53.2± .29 P. E.	53.2± .32 P. E.
Q	4.5	4.4	4.9	4.7	4.3

STRENGTH OF THE HAND

DYNAMOMETER TEST

Strength of the hand was measured with a Smedley dynamometer, reading kilograms. The divisions on the scale were large enough to allow readings of half kilograms.

The experimenter instructed the child as follows: "This instrument is to measure how strong your hand is. I will show you how it works. I take it in my hand this way [holding it down at the side] and then squeeze just as hard as I can. The harder I squeeze, the farther these pointers move on the scale, and one of them stays in place when I let go to show how hard I have squeezed. [Illustrates.] Now hold out your hand and let me see how big it is. [Adjusts the instrument to the size of the child's

TABLE 10 — VITAL CAPACITY IN CUBIC CENTIMETERS

Boys

PERCENTILES	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	1656	1940	2217	2536	2744
10	1831	2071	2395	2702	2893
15	1933	2165	2514	2826	3002
20	2019	2243	2623	2913	3073
25	2072	2312	2706	3001	3143
30	2127	2380	2789	3103	3219
35	2180	2465	2871	3204	3319
40	2233	2557	2953	3279	3417
45	2284	2639	3038	3355	3503
50	2336	2712	3128	3433	3589
55	2393	2785	3213	3514	3671
60	2454	2856	3281	3597	3753
65	2526	2928	3348	3668	3848
70	2600	2999	3421	3739	3963
75	2686	3094	3520	3817	4062
80	2772	3188	3625	3931	4153
85	2894	3303	3765	4062	4268
90	3052	3439	3948	4221	4413
95	3376	3699	4171	4392	4617
No. of Cases	826	671	599	377	310
Median	2336 ± 13 P. E.	2712 ± 19 P. E.	3128 ± 21 P. E.	3433 ± 26 P. E.	3589 ± 33 P. E.
Q	307	391	407	408	460

hand.] Now you take it. Hold it down at your side, and see how hard you can squeeze."

The experimenter watched the child closely, and if he saw him pushing against his side with the instrument, he warned him not to do so again and discarded that reading. The hands were tested alternately, three times each, and the best reading for each hand recorded.

The results are presented in the form of five-percentile scales for boys and girls separately, and for the right and left hand in each case (Tables 12 and 13). In taking the average percentile rank for the individual, this test is used as one of the seven measures. Its close relation to mere size and the comparatively small element of skill involved in it made us feel that it deserves no more weight than this in the scale of physical abilities.

TABLE 11 — VITAL CAPACITY IN CUBIC CENTIMETERS

Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	1401	1715	1778	1836	1742
10	1589	1837	1915	1940	1916
15	1721	1909	2017	2042	2029
20	1818	1980	2074	2140	2106
25	1863	2030	2130	2220	2182
30	1909	2072	2186	2271	2246
35	1955	2114	2239	2323	2305
40	2001	2157	2290	2374	2365
45	2047	2199	2341	2424	2420
50	2093	2255	2392	2473	2469
55	2140	2312	2443	2521	2518
60	2186	2369	2494	2569	2567
65	2237	2429	2544	2624	2620
70	2290	2493	2595	2691	2682
75	2343	2557	2664	2758	2744
80	2396	2624	2736	2839	2807
85	2489	2698	2813	2881	2890
90	2584	2773	2946	3061	2973
95	2749	2960	3126	3114	3161
No. of Cases . .	642	523	466	334	191
Median	2093±12 P. E.	2255±14 P. E.	2392±15 P. E.	2473±18 P. E.	2469±25 P. E.
Q	240	264	267	269	281

In order to include both right- and left-hand measurements, the value used is the median between the percentile rank of the right hand and that of the left. Thus an individual whose rank was forty for the right hand and sixty for the left would have this test represented by a value of fifty in the average scale.

Steadiness of the Hand

(1)

Steadiness of the hand was measured with the steadiness test described in Whipple's Manual (Test 13). The instrument is a metal plate set in

TABLE 12 — STRENGTH OF THE HAND IN KILOGRAMS

Boys

Percentiles	Right Hand					Percentiles	Left Hand				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.		14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5 . .	17.6	21.7	24.8	31.3	34.5	5 . .	17.0	20.7	23.3	29.4	31.9
10 . .	19.4	23.5	27.2	34.0	38.1	10 . .	18.9	22.5	25.9	31.4	34.6
15 . .	20.7	24.7	29.4	36.1	40.0	15 . .	20.0	23.6	27.7	33.4	36.2
20 . .	21.9	25.8	30.8	38.1	41.1	20 . .	21.0	24.7	29.1	35.2	37.8
25 . .	22.8	26.8	31.9	39.5	42.0	25 . .	22.0	25.6	30.3	36.6	39.0
30 . .	23.5	27.7	33.2	40.7	43.0	30 . .	22.8	26.4	31.3	37.6	40.0
35 . .	24.3	28.6	34.4	41.5	44.2	35 . .	23.5	27.4	32.3	38.6	41.2
40 . .	24.9	29.2	35.3	42.4	44.9	40 . .	24.1	28.4	33.4	39.5	42.4
45 . .	25.5	29.9	36.2	43.3	45.6	45 . .	24.7	29.2	34.9	40.4	43.3
50 .	26.1	30.8	37.3	44.1	46.2	50 . .	25.3	30.0	35.3	41.4	44.3
55 . .	26.8	32.1	38.5	45.2	46.9	55 . .	25.9	31.0	36.0	42.4	45.0
60 . .	27.5	33.6	39.7	46.3	47.8	60 . .	26.5	32.1	37.0	43.2	45.6
65 . .	28.2	35.0	40.9	47.3	48.8	65 . .	27.3	33.3	38.1	44.1	46.3
70 . .	29.1	36.2	42.1	48.6	49.9	70 . .	28.1	34.6	39.4	45.1	47.1
75 . .	30.1	38.1	43.8	50.0	51.0	75 . .	29.0	35.7	40.8	46.4	48.1
80 . .	31.3	39.6	45.3	51.2	51.9	80 . .	30.0	36.9	42.3	47.7	49.2
85 . .	32.5	41.2	46.6	52.2	53.2	85 . .	31.2	38.4	44.1	49.1	50.3
90 . .	34.4	43.9	49.2	54.0	55.1	90 . .	32.9	40.4	46.3	50.7	52.0
95 . .	38.1	45.9	52.3	56.1	58.0	95 . .	36.5	42.6	48.2	53.4	54.6
No. of Cases	838	587	609	455	324	No. of Cases	839	590	610	454	331
Median	26.1 ± .16 P. E.	30.8 ± .40 P. E.	37.3 ± .30 P. E.	44.1 ± .31 P. E.	46.2 ± .31 P. E.	Median	25.3 ± .15 P. E.	30.0 ± .35 P. E.	35.3 ± .24 P. E.	41.4 ± .29 P. E.	44.3 ± .32 P. E.
Q . .	3.7	5.7	6.0	5.3	4.5	Q . .	3.5	5.1	4.8	4.9	4.6

a frame which supports it at an angle of 45° to the surface of the table. The plate contains nine round holes, arranged in two rows—four in the upper row and five in the lower row. The holes decrease in size from the left-hand one in the upper row, which is a half inch in diameter, to the right-hand one in the lower row, which is seven sixty-fourths of an inch. The instrument has a binding post which is attached to a battery of three dry cells. The battery is attached at its other pole to one binding post of a telegraph sounder. To the other post of the sounder is attached a flexible wire, which leads to a metal pencil having a wooden holder.

TABLE 13 — STRENGTH OF THE HAND IN KILOGRAMS

Girls

PERCENTILES	RIGHT HAND					PERCENTILES	LEFT HAND				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.		14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5 . .	15.8	19.4	20.7	22.9	23.2	5 . .	15.5	17.9	19.4	20.7	20.0
10 . .	18.3	21.3	22.3	24.8	24.6	10 . .	17.2	19.6	20.9	22.3	22.0
15 . .	19.3	22.7	23.3	25.8	25.5	15 . .	18.6	20.8	21.8	23.4	23.2
20 . .	20.1	23.5	24.2	26.7	26.4	20 . .	19.3	21.7	22.8	24.3	24.3
25 . .	20.8	24.3	25.0	27.3	27.0	25 . .	20.0	22.5	23.2	25.1	25.0
30 . .	21.4	24.9	25.7	28.0	27.5	30 . .	20.7	23.1	23.7	25.7	25.6
35 . .	22.0	25.4	26.4	28.5	28.0	35 . .	21.3	23.7	24.3	26.4	26.1
40 . .	22.7	26.0	27.0	29.0	28.6	40 . .	21.8	24.2	24.8	27.0	26.8
45 . .	23.5	26.5	27.5	29.4	29.1	45 . .	22.3	24.8	25.4	27.6	27.5
50 . .	24.3	27.1	28.1	29.9	29.6	50 . .	23.0	25.4	26.0	28.2	28.1
55 . .	24.9	27.7	28.7	30.3	30.2	55 . .	23.6	25.9	26.7	28.8	28.7
60 . .	25.4	28.3	29.2	30.8	30.7	60 . .	24.3	26.5	27.4	29.3	29.2
65 . .	26.0	28.9	29.7	31.4	31.4	65 . .	24.9	27.1	28.1	29.8	29.8
70 . .	26.6	29.5	30.3	31.9	32.0	70 . .	25.6	27.8	28.9	30.4	30.2
75 . .	27.5	30.1	30.9	32.5	32.8	75 . .	26.2	28.4	29.5	31.0	30.9
80 . .	28.3	30.8	31.6	33.5	33.9	80 . .	26.9	29.1	30.3	31.7	31.6
85 . .	29.2	31.2	32.3	34.6	35.0	85 . .	27.9	29.8	31.2	32.5	32.4
90 . .	30.1	32.5	33.8	36.5	36.3	90 . .	29.0	30.4	32.1	33.6	33.8
95 . .	31.6	33.4	36.1	39.2	38.7	95 . .	30.5	32.8	33.6	35.8	35.9
No. of Cases	656	455	493	366	206	No. of Cases	657	455	496	367	205
Median	24.3± .16 P. E.	27.1± .17 P. E.	28.1± .17 P. E.	29.9± .18 P. E.	29.6± .25 P. E.	Median	23.0± .14 P. E.	25.4± .17 P. E.	26.0± .18 P. E.	28.2± .19 P. E.	28.1± .26 P. E.
Q . .	3.4	2.9	3.0	2.6	2.9	Q . .	3.1	3.0	3.2	3.0	3.0

The metal pencil is about the size and shape of an ordinary lead pencil except that the metal rod projects about two inches beyond the wooden holder.

The child was so placed with reference to the table that his elbow was on a level with its surface, and at such a distance from the instrument that when the pointer was held just inside one of the holes the elbow was as far forward as the front surface of the body. The adjustments of height were made by means of a wooden platform large enough to hold the chair on which the child sat, and a series of wooden frames, each about an inch thick which could be placed under it. The shorter the child, the more

TABLE 14 — STEADINESS OF THE HAND IN HOLES AND CONTACTS

Boys

Percentiles	Right Hand				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	II- 3	III-10	III- 4	IV-10	V-12
10	III-10	III- 3	IV-10	IV- 6	V- 9
15	III- 7	IV-11	IV- 7	V-10	V- 6
20	III- 4	IV- 9	IV- 2	V- 7	VI-12
25	III- 1	IV- 7	V-11	VI-12	VI -9
30	IV-12	IV- 5	V- 9	VI-11	VI- 7
35	IV-10	IV- 3	V- 6	VI-10	VI- 5
40	IV- 8	IV- 1	VI-12	VI- 8	VII-11
45	IV- 6	V-12	VI-11	VI- 7	VII-10
50	IV- 4	V- 9	VI- 9	VI- 4	VII- 9
55	IV- 3	V- 6	VI- 8	VII-11	VII- 7
60	IV- 1	V- 3	VI- 6	VII-10	VII- 6
65	IV- 0	V- 0	VI- 1	VII- 8	VII- 0
70	V- 9	VI-10	VII-11	VII- 7	VIII-10
75	V- 5	VI -6	VII- 8	VII- 0	VIII- 9
80	V- 2	VI- 2	VII- 6	VIII-11	VIII- 7
85	VI-11	VII-10	VIII-11	VIII- 8	VIII- 6
90	VI- 4	VII- 2	VIII- 7	VIII- 6	IX-11
95	VII- 8	VIII- 4	IX-10	IX-10	IX- 7
No. of Cases . .	831	652	618	464	334
Median	IV-4 ± .50 P. E.	V-9 ± .63 P. E.	VI-9 ± .73 P. E.	VI-4 ± .75 P. E.	VII-9 ± .90 P. E.
Q	11.0	13.5	14.5	13.0	13.0

frames were needed under the platform. The same device was used to adjust the height of the child to the tapping board and to the card-sorting box.

When the child was correctly placed, the experimenter proceeded as follows: "This is an instrument to measure the steadiness of your hand. When I put this metal pencil into one of these holes and hold it still [illustrates], nothing happens; but as soon as my hand moves a little and makes the pencil touch the side of the hole, it causes that click [illustrates]. I want you to put the pencil straight into the middle of this hole [pointing to the fourth one—the smallest in the top row] and see how still you can hold it—how few clicks you can make. Now try it to let me see if you hold the pencil properly. [Corrects any errors of position.] Now that is

TABLE 14—*Continued*

Percentiles	Right Hand				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	II-10	II- 3	III-12	III- 7	IV-10
10	II- 5	III-11	III-10	IV-11	IV- 8
15	II- 1	III- 8	III- 8	IV-10	IV- 5
20	III-11	III- 5	III- 6	IV- 8	V-11
25	III- 9	III- 3	IV-12	IV- 6	V-10
30	III- 7	III- 0	IV-10	V-12	V- 8
35	III- 6	IV-11	IV- 9	V-10	V- 6
40	III- 4	IV- 9	IV- 8	V- 9	VI-12
45	III- 2	IV- 7	IV- 6	V- 7	VI-10
50	III- 1	IV- 6	IV- 0	VI-12	VI- 9
55	IV-12	IV- 4	V-11	VI-11	VI- 7
60	IV- 9	IV- 2	V- 9	VI- 9	VI- 6
65	IV- 7	IV- 0	V- 7	VI- 8	VII-12
70	IV- 5	V-11	VI-12	VI- 6	VII-10
75	IV- 3	V- 6	VI-10	VI- 0	VII- 8
80	IV- 1	V- 2	VI- 7	VII-10	VII- 6
85	IV- 0	VI- 9	VI- 4	VII- 8	VII- 1
90	V- 7	VI- 2	VII- 8	VII- 3	VIII- 8
95	VI- 8	VII- 4	VIII- 9	VIII- 8	VIII- 5
No. of Cases . .	829	652	616	464	334
Median	III- 1±.63 P. E.	IV- 6±.56 P. E.	IV- 0±.70 P. E.	VI-12±.93 P. E.	VI- 9±.96 P. E.
Q	14.5	11.5	14.0	16.0	14.0

right. I will tell you when to put the pencil in, and when to take it out, and don't mind the first few clicks when you put it in. They don't count, anyway."

The stop watch was started as the pencil was placed in the hole, but contacts were not counted during the first three seconds. Contacts were counted for fifteen seconds, making eighteen in all in which the pencil was held in each hole. The point arbitrarily selected as the limit of the child's capacity was the smallest hole in which not more than twelve contacts were made during the fifteen seconds.

It was necessary for the experimenter to watch the child very carefully

TABLE 15—STEADINESS OF THE HAND IN HOLES AND CONTACTS

Girls

Percentiles	Right Hand				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	III-11	III- 3	IV-12	IV-10	IV- 7
10	III- 7	IV-10	IV- 8	IV- 7	IV- 0
15	III- 3	IV- 8	IV- 4	V-12	V- 9
20	III- 0	IV- 5	V-12	V-10	V- 5
25	IV-10	IV- 3	V-11	V- 8	VI-11
30	IV- 8	IV- 0	V- 9	V- 4	VI-10
35	IV- 6	V-10	V- 7	VI-11	VI- 8
40	IV- 4	V- 7	V- 6	VI-10	VI- 6
45	IV- 2	V- 4	VI-12	VI- 8	VI- 3
50	IV- 0	V- 2	VI-10	VI- 7	VII-11
55	V-11	VI-12	VI- 8	VI- 3	VII-10
60	V- 9	VI- 8	VI- 7	VII-11	VII- 8
65	V- 6	VI- 5	VI- 2	VII- 9	VII- 6
70	V- 3	VI- 2	VII-11	VII- 7	VII- 2
75	V- 1	VII-11	VII- 8	VII- 5	VIII-11
80	VI- 9	VII- 6	VII- 6	VIII-11	VIII- 8
85	VI- 5	VII- 1	VIII-10	VIII- 8	VIII- 6
90	VI- 1	VIII- 8	VIII- 6	VIII- 4	IX-11
95	VII- 6	VIII- 1	IX- 9	IX- 8	IX- 7
No. of Cases . .	651	523	511	355	197
Median	IV- 0± .51 P.E.	V- 2± .85 P.E.	VI-10± .80 P.E.	VI- 7± .96 P.E.	VII-11±1.16P.E.
Q	11.5	15.5	14.5	14.5	13.0

during this test, since many errors were possible. Often, in spite of the preliminary warning, the pencil was put into the hole at an angle instead of perpendicularly to the surface and had to be straightened before the test could proceed. Sometimes it was withdrawn from the hole and held just barely in front of it instead of inside. Sometimes it was held against the side of the hole, thus causing a continuous contact but only one sound. The same result could be accomplished by thrusting the pencil very far into the hole until it touched the back of the instrument. Each experimenter was trained to watch the child's hand continuously during the fifteen seconds of the test, except for the necessary glances at the stop watch. If any of these errors occurred, the test was stopped, the error pointed out, and the same hole tried again later.

TABLE 15—*Continued*

Percentiles	Left Hand				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	II- 8	III-11	III-11	III-10	III- 7
10	II- 1	III- 8	III- 6	IV-12	IV-11
15	III-10	III- 4	IV-12	IV-11	IV-10
20	III- 8	III- 0	IV-11	IV- 9	IV- 8
25	III- 6	IV-10	IV- 9	IV- 7	IV- 6
30	III- 4	IV- 8	IV- 8	IV- 6	IV- 0
35	III- 2	IV- 7	IV- 6	IV- 0	V-11
40	III- 0	IV- 5	IV- 4	V-11	V- 8
45	IV-11	IV- 3	V-12	V- 9	V- 7
50	IV- 9	IV- 1	V-10	V- 8	V- 5
55	IV- 7	V-12	V- 8	V- 6	VI-11
60	IV- 6	V- 9	V- 7	VI-11	VI- 8
65	IV- 4	V- 6	VI-12	VI- 9	VI- 6
70	IV- 2	V- 3	VI-10	VI- 7	VII-11
75	IV- 1	V- 1	VI- 8	VI- 2	VII- 9
80	V-10	VI- 9	VI- 6	VII-10	VII- 6
85	V- 5	VI- 4	VII-11	VII- 7	VIII-11
90	V- 1	VII-11	VII- 9	VIII-10	VIII- 7
95	VI- 6	VIII-10	VIII- 8	VIII- 3	IX-10
No. of Cases . .	645	520	510	356	195
Median	IV- 9± .44 P. E.	IV- 1± .60 P. E.	V-10± .75 P. E.	V- 8±1.03 P. E.	V- 5±1.60 P. E.
Q	9.0	11.0	13.5	15.5	18.0

The experimenter began each time with the fourth hole in the top row, using the child's right hand, and followed with a test of the left hand in the same hole. The hands were alternated throughout the test, and the instrument moved back and forth along the table to bring the required hole opposite the hand to be tested. If more than twelve contacts were made in the fourth hole, the next trial was given in the third hole, a larger one. If the number of contacts made was less than thirteen but more than three, the next trial was given in the fifth hole, a smaller one. If the number of contacts was three or less, the fifth hole was omitted, and the next trial given in the sixth. The object of omitting a hole in case the number of contacts was very small was to equalize the fatigue effects. If there was a sudden jump in the number of contacts made, or some disturbance occurred which affected a given test, the same hole was tried more than once. If everything went smoothly and the progression from hole to hole was normal, each hole was tried but once with each hand.

The chief source of error in this piece of apparatus is that very light touches are sometimes not registered, either because one of the metal surfaces has become tarnished or because the batteries have begun to weaken. The inner surfaces of the holes and the metal pencil should be kept polished, and the batteries should be renewed every few months. The test cannot be regarded as a very satisfactory one from a scientific standpoint, because the possibilities of error, both in giving the test and in recording the results, are obviously many.

The results were recorded in terms of the smallest hole reached with each hand in which the number of contacts was twelve or less, and the number of contacts in that hole. In figuring percentiles in this test, the holes were taken in order, and the number of contacts from twelve down to and including zero considered as thirteen steps within each hole. In actual distribution, it was found that in each case, contacts were bunched in the upper half (6 to 12). The reason for the larger number of records with contacts from 6 to 12 seems to be that the very fact of making several contacts tended to increase the tremor of the hand so much that more than 5 were apt to occur.

The results are presented in the form of a five-percentile scale, for boys and girls separately, and for right and left hand separately (Tables 14 and 15). In averaging the percentile ranks for the individual, this test has been used as one of seven measures. If its scientific accuracy were greater, we might have felt that it deserved greater weight in the scale. In order to take account of both right- and left-hand measurements, the value used is the median between the percentile rank for the right hand and that for the left hand.

RAPIDITY OF MOVEMENT OF THE HAND

TAPPING TEST (1)

The instrument used in measuring the rapidity of the hand in tapping was the tapping board described in Whipple's Manual (Test 10), used with an electric enumerator and a stop watch. The electric enumerator has frequently been criticized as inaccurate in recording contacts in tapping. Doubtless the individual instruments differ in reliability. We found ours accurate for any rate of speed which obtained in this form of test.

TABLE 16 — RAPIDITY OF MOVEMENT OF THE HAND IN NUMBER OF TAPS — 30-SECOND PERIOD

Boys

PERCENTILES	RIGHT HAND					PERCENTILES	LEFT HAND				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.		14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5 . .	143	148	154	156	161	5 . .	114	121	126	125	129
10 . .	151	158	163	163	167	10 . .	121	128	133	132	136
15 . .	155	162	167	168	171	15 . .	126	131	137	137	141
20 . .	159	165	171	172	174	20 . .	129	134	141	142	144
25 . .	163	168	174	175	177	25 . .	132	138	144	145	147
30 . .	166	171	177	178	180	30 . .	135	141	146	148	150
35 . .	169	174	180	181	183	35 . .	138	143	149	151	152
40 . .	171	177	183	184	186	40 . .	140	145	152	153	154
45 . .	174	179	185	186	188	45 . .	143	148	154	156	157
50 . .	176	182	188	189	191	50 . .	145	150	157	159	159
55 . .	178	184	190	192	193	55 . .	148	153	159	161	162
60 . .	181	187	193	195	195	60 . .	150	155	162	164	164
65 . .	184	190	196	198	198	65 . .	153	157	165	167	167
70 . .	186	193	199	200	201	70 . .	155	160	167	170	169
75 . .	189	196	203	204	205	75 . .	158	163	170	174	173
80 . .	193	200	207	208	209	80 . .	161	166	175	177	177
85 . .	198	206	212	214	214	85 . .	166	170	180	182	182
90 . .	204	212	220	221	220	90 . .	171	177	188	189	189
95 . .	214	222	232	234	231	95 . .	180	186	199	200	197
No. of Cases	799	677	615	472	343	No. of Cases	794	674	611	472	342
Median	176 ± .58 P. E.	182 ± .69 P. E.	188 ± .73 P. E.	189 ± .83 P. E.	191 ± .94 P. E.	Median	145 ± .59 P. E.	150 ± .60 P. E.	157 ± .66 P. E.	159 ± .83 P. E.	159 ± .90 P. E.
Q . .	13.0	14.0	14.5	14.5	14.0	Q . .	13.0	12.5	13.0	14.5	13.0

In giving the test, the child was adjusted with reference to the tapping board at such a height that when sitting up straight in his chair, his forearm rested easily on the tapping board. (For method of adjusting height, see Steadiness Test.)

The experimenter then explained the test as follows: "I want you to rest your arm on the board this way [does it] so that it touches the board all the way from the elbow to the wrist, and then see how fast you can tap with this instrument on this plate—this way, just moving your hand from the wrist [does it]. Do you see that pointer move once every time

TABLE 17—RAPIDITY OF MOVEMENT OF THE HAND IN NUMBER OF TAPS—60-SECOND PERIOD

Boys

Percentiles	Right Hand					Percentiles	Left Hand				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.		14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5 . .	270	283	295	300	319	5 . .	220	228	242	243	249
10 . .	285	297	307	310	327	10 . .	228	240	250	254	261
15 . .	295	305	315	320	334	15 . .	235	247	259	263	271
20 . .	303	311	323	327	341	20 . .	242	254	265	270	276
25 . .	308	317	329	333	347	25 . .	248	260	271	276	281
30 . .	313	322	335	339	352	30 . .	254	265	276	282	285
35 . .	318	328	341	344	357	35 . .	260	270	282	287	290
40 . .	322	334	346	349	362	40 . .	264	274	287	292	294
45 . .	327	339	351	354	366	45 . .	269	276	292	297	298
50 . .	331	344	355	359	371	50 . .	273	283	297	303	302
55 . .	336	349	360	365	377	55 . .	278	288	303	309	308
60 . .	340	354	366	370	382	60 . .	282	293	308	315	313
65 . .	346	358	372	376	386	65 . .	287	297	313	321	318
70 . .	351	364	377	382	391	70 . .	291	301	318	326	323
75 . .	356	370	384	390	398	75 . .	296	308	324	332	328
80 . .	363	376	392	398	408	80 . .	302	314	332	338	334
85 . .	372	384	399	409	418	85 . .	312	320	340	348	343
90 . .	383	397	414	423	431	90 . .	323	333	354	360	355
95 . .	399	417	438	449	456	95 . .	343	351	376	377	377
No. of Cases	796	677	612	474	343	No. of Cases	793	675	611	472	343
Median	331±1.67 P. E.	334±1.25 P. E.	355±1.41 P. E.	359±1.67 P. E.	371±1.87 P. E.	Median	273±1.07 P. E.	283±1.15 P. E.	297±1.36 P. E.	303±1.61 P. E.	302±1.08 P. E.
Q . .	24	26	28	29	26	Q . . .	24	24	27	28	24

that pencil touches the plate, so that by watching it, I can tell how fast you are tapping? Be sure not to lift your wrist from the board while you are tapping. Now you try it [the child is allowed to tap a very few seconds, and the method criticized if wrong]. Now hold your hand all ready, and the instant I say 'now,' begin to tap, and tap just as fast as you possibly can until I tell you to stop."

The experimenter then took the reading of the dial, placed the stop watch in his right hand, and gave the signal to start. He started the watch when the child's hand moved down for the first tap, and then

TABLE 18 — RAPIDITY OF MOVEMENT OF THE HAND IN NUMBER OF TAPS — 30-SECOND PERIOD

Girls

Percentiles	Right Hand					Percentiles	Left Hand				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.		14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5 . .	145	149	155	157	156	5 . .	113	116	122	126	125
10 . .	151	155	162	162	162	10 . .	121	123	130	132	132
15 . .	155	160	164	165	167	15 . .	125	129	133	135	136
20 . .	159	162	167	169	171	20 . .	128	132	136	139	141
25 . .	162	165	170	171	173	25 . .	131	135	139	142	143
30 . .	164	167	172	174	175	30 . .	134	137	142	144	145
35 . .	167	170	174	176	177	35 . .	136	140	144	146	148
40 . .	169	172	176	178	179	40 . .	139	142	147	148	150
45 . .	171	174	178	181	181	45 . .	141	145	149	150	152
50 . .	173	176	180	183	183	50 . .	144	147	152	152	154
55 . .	175	178	182	185	185	55 . .	146	149	154	155	156
60 . .	177	180	185	187	186	60 . .	148	152	156	157	158
65 . .	179	182	188	189	188	65 . .	151	154	158	159	160
70 . .	182	185	190	191	190	70 . .	154	156	160	162	163
75 . .	185	188	194	195	193	75 . .	156	159	163	165	166
80 . .	188	192	197	198	197	80 . .	159	162	166	169	169
85 . .	192	197	200	201	201	85 . .	163	166	170	173	173
90 . .	198	202	205	207	209	90 . .	168	171	175	177	179
95 . .	205	209	214	215	220	95 . .	176	178	183	185	189
No. of Cases	625	531	525	392	243	No. of Cases	623	531	523	389	242
Median	173 ± .58 P. E.	176 ± .62 P. E.	180 ± .69 P. E.	183 ± .88 P. E.	183 ± .80 P. E.	Median	144 ± .63 P. E.	147 ± .65 P. E.	152 ± .69 P. E.	152 ± .73 P. E.	154 ± .92 P. E.
Q . .	11.5	11.5	12.0	12.0	10.0	Q . . .	12.5	12.0	12.0	11.5	11.5

took the readings of the dial when the second hand passed the 15-, 30-, 45-, and 60-second marks.

This method of taking readings is undoubtedly open to criticism. To read one moving point by another is a difficult and uncertain operation. None of the experimenters was allowed to give the test until he had had a period of practice, and had tested his ability by taking readings simultaneously with a skilled person. Because of these sources of error, small differences between one record and another cannot be considered significant, but large differences certainly can be so considered.

TABLE 19 — RAPIDITY OF MOVEMENT OF THE HAND IN NUMBER OF TAPS — 60-SECOND PERIOD

Girls

Percentiles	Right Hand					Percentiles	Left Hand				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.		14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5 . .	277	281	293	301	312	5 . .	213	223	232	241	243
10 . .	286	294	305	309	323	10 . .	227	238	244	251	252
15 . .	293	303	312	316	331	15 . .	236	245	250	261	259
20 . .	300	307	319	322	337	20 . .	243	251	257	266	267
25 . .	304	312	323	326	341	25 . .	247	257	263	270	274
30 . .	308	316	326	331	345	30 . .	252	262	268	275	279
35 . .	312	321	329	335	348	35 . .	257	266	274	280	283
40 . .	317	325	333	340	351	40 . .	261	270	279	284	287
45 . .	321	329	336	344	355	45 . .	265	274	284	288	291
50 . .	325	333	339	348	359	50 . .	269	278	288	291	295
55 . .	330	337	344	352	362	55 . .	273	282	292	295	299
60 . .	335	342	348	356	365	60 . .	278	287	295	299	303
65 . .	340	347	353	361	368	65 . .	283	292	299	304	307
70 . .	345	352	357	366	371	70 . .	288	296	304	309	311
75 . .	350	357	362	371	376	75 . .	293	301	309	314	315
80 . .	356	363	369	376	383	80 . .	298	307	315	320	320
85 . .	362	371	375	383	391	85 . .	306	314	320	326	328
90 . .	372	380	383	394	405	90 . .	315	321	331	338	338
95 . .	385	395	398	412	432	95 . .	331	335	346	353	357
No. of Cases	624	531	524	392	243	No. of Cases	625	529	523	389	242
Median	325 ± 1.15 P. E.	333 ± 1.25 P. E.	339 ± 1.09 P. E.	348 ± 1.46 P. E.	359 ± 1.44 P. E.	Median	269 ± 1.15 P. E.	278 ± 1.19 P. E.	288 ± 1.25 P. E.	291 ± 1.40 P. E.	295 ± 1.68 P. E.
Q . .	23	23	20	23	18	Q . . .	23	22	23	22	21

The number of taps for each quarter of a minute was obtained by subtracting each reading of the dial from the following one. The number of taps for the first and second half minutes, and for the whole minute were then added up.

In the first formulation of results (3, p. 76) an index of fatigue was calculated by finding out in each case what percentage of the number of taps in the first fifteen seconds had been lost in the last fifteen seconds. The justice of considering the value as an indication of fatigue depends upon whether or not the individual being tested was putting forth his best effort throughout the test. It is obviously impossible to be sure of this in any case. The instructions were given in a way to call out a maximum effort for speed, but of course not every child responded. There are even a few negative indices in the series. Since further study of the results of this test, made since the publication of the monograph, tend to show that children of superior mental ability on the whole show most fatigue measured by this method, we are forced to the conclusion that what we are obtaining is not a real measure of fatigue, but rather a measure of the degree of initial effort. If this is true, to rate a child low on a high "index of fatigue" would be a real injustice, since it would be penalizing him for making a great effort to carry out the instructions of the test exactly. In making up our scale, therefore, index of fatigue was not employed as one of the measures. However, by using the measure both for the 30- and for the 60-second intervals, a positive value is given in the scale both for a high initial effort and for ability to maintain speed.

The results are presented in terms of five-percentile summaries for boys and girls separately, including for each sex the scale for 30 seconds, tapping, right and left hand, and for 60 seconds, tapping, right and left hand (Tables 16, 17, 18, and 19). In taking the average of percentile ranks for the individual, this test is represented by two measures. The degree of accuracy in giving the test and the importance of speed as an element in physical skill seemed to warrant this much weight. One measure represents the right hand, and one the left. For each hand, the measure used is the median between the percentile rank for the number of taps in 30 seconds and that for the number of taps in 60 seconds. Thus both the initial speed and the endurance of each hand is taken into consideration.

Card-Sorting

The card-sorting test was performed with the Jastrow card-sorting box: a black box, with four compartments, each marked with a circle of color about a centimeter in diameter—blue, green, yellow, and red. The colors used were the pure colors of the Hering papers. A pack of forty-eight cards, each marked with a corresponding circle of color, four of each kind, so arranged that no two cards of the same color followed one another so that there were no rhythms of sequence, was sorted into the four compartments. For the purpose of calculating accuracy, fifty cards would have been better than forty-eight. We used the apparatus as it was furnished by the dealers.

In giving the test, the height of the child was adjusted to the box so that his hands, held in the usual position for sorting, came a little above the surface of the box. Height was adjusted by allowing the child to stand on a platform of the required height (see Steadiness Test). The child was placed directly in front of the box and close to it so that a minimum of reaching was involved in the process of sorting.

The instructions were given as follows: "You see this black box, with

TABLE 20 — CARD-SORTING

Boys

Percentiles	Time in Seconds					Percentiles	Index in Seconds				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.		14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5 . .	62.9	57.4	53.7	51.7	53.3	5 . .	65.0	58.7	55.0	53.6	55.4
10 . .	58.4	53.8	50.3	48.8	48.4	10 . .	60.9	55.2	52.5	49.6	50.1
15 . .	55.7	51.9	48.4	47.0	46.1	15 . .	58.1	53.3	50.0	48.0	47.8
20 . .	54.1	50.0	46.7	45.1	44.5	20 . .	55.7	51.5	48.0	46.4	45.5
25 . .	52.6	48.8	45.0	44.2	43.5	25 . .	54.2	49.9	46.0	44.9	44.3
30 . .	51.2	47.6	44.1	43.3	42.5	30 . .	52.9	48.8	44.7	44.3	43.3
35 . .	49.9	46.4	43.2	42.3	41.6	35 . .	51.7	47.7	43.9	43.0	42.1
40 . .	48.8	45.3	42.3	41.4	40.6	40 . .	50.5	46.5	43.1	42.0	41.3
45 . .	47.7	44.3	41.4	40.5	39.7	45 . .	49.4	45.4	42.3	41.0	40.3
50 . .	46.7	43.4	40.5	39.7	39.0	50 . .	48.2	44.4	41.5	40.1	39.5
55 . .	45.6	42.6	39.7	38.9	38.2	55 . .	47.0	43.4	40.7	39.3	38.7
60 . .	44.6	41.7	38.9	38.2	37.5	60 . .	45.9	42.5	39.8	38.6	37.9
65 . .	43.7	40.8	38.1	37.5	36.7	65 . .	44.6	41.5	38.7	37.8	37.2
70 . .	42.7	39.9	37.3	36.8	36.0	70 . .	43.6	40.5	37.6	37.0	36.4
75 . .	41.8	38.8	36.5	36.0	35.2	75 . .	42.6	39.4	36.5	36.3	35.6
80 . .	40.8	37.6	35.7	35.3	34.1	80 . .	41.6	38.2	35.5	35.5	34.8
85 . .	39.7	36.5	34.7	34.0	32.8	85 . .	40.5	37.0	34.1	34.5	32.6
90 . .	37.7	35.4	32.8	32.5	31.6	90 . .	38.7	35.8	32.6	32.8	31.4
95 . .	35.7	32.8	30.9	31.1	30.3	95 . .	36.2	33.6	31.1	31.1	30.3
No. of Cases	857	679	622	470	354	No. of Cases	828	663	622	466	350
Median	46.7± .24 P. E.	43.4± .24 P. E.	40.5± .21 P. E.	39.7± .24 P. E.	39.0± .28 P. E.	Median	48.2± .25 P. E.	44.4± .25 P. E.	41.5± .24 P. E.	40.1± .25 P. E.	40.1± .29 P. E.
Q . .	5.4	5.0	4.3	4.1	4.2	Q . . .	5.8	5.3	4.8	4.3	4.3

the four parts, each one marked with a color. Tell me what color this is, and this one. Yes. Now each of these cards is marked with a circle of one of these colors [showing him several]. What I want you to do is to drop each card into the part of the box marked with its own color, and see how fast you can do it. You are right-handed, are you not? Then take the pack of cards in your left hand, turned face down, and hold them that way until I tell you to begin. If you should make a mistake and drop a card into the wrong division, don't stop to try to change or correct it, because that would take too much time. Just go right on,

TABLE 21 — CARD-SORTING

Girls

Percentiles	Time in Seconds					Percentiles	Index in Seconds				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.		14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5 . .	55.9	51.0	47.2	47.4	46.8	5 . .	57.8	53.9	48.8	49.3	48.7
10 . .	52.6	48.5	44.5	44.3	44.2	10 . .	53.8	49.9	45.9	45.9	45.0
15 . .	50.0	46.7	43.3	42.9	42.9	15 . .	51.7	48.0	43.8	44.1	43.6
20 . .	48.7	45.0	42.2	41.5	41.5	20 . .	49.8	46.1	43.1	42.6	42.3
25 . .	47.4	44.0	41.1	40.1	40.2	25 . .	48.6	44.7	42.3	41.3	40.9
30 . .	46.2	43.1	40.0	39.5	39.4	30 . .	47.4	43.7	41.5	40.0	39.8
35 . .	45.0	42.2	39.4	38.8	38.6	35 . .	46.2	42.8	40.6	39.4	39.1
40 . .	44.3	41.3	38.8	38.1	37.9	40 . .	45.0	41.9	39.8	38.7	38.3
45 . .	43.5	40.4	38.2	37.4	37.1	45 . .	44.3	41.0	39.1	38.0	37.5
50 . .	42.8	39.5	37.5	36.7	36.4	50 . .	43.5	40.1	38.4	37.4	36.8
55 . .	42.0	38.8	36.9	36.1	35.6	55 . .	42.7	39.3	37.7	36.7	36.0
60 . .	41.3	38.1	36.3	35.4	34.8	60 . .	42.0	38.5	37.2	36.0	35.3
65 . .	40.5	37.2	35.7	34.7	34.1	65 . .	41.2	37.7	36.6	35.3	34.5
70 . .	39.6	36.5	35.1	33.9	33.3	70 . .	40.4	36.9	36.0	34.6	33.6
75 . .	38.6	35.7	34.2	33.2	32.6	75 . .	39.4	36.1	35.3	33.7	32.9
80 . .	37.6	34.8	33.2	32.4	31.8	80 . .	38.2	35.3	34.5	32.9	32.0
85 . .	36.6	33.5	32.2	31.7	31.1	85 . .	37.0	34.0	33.6	32.0	31.6
90 . .	35.5	32.2	31.2	30.9	30.3	90 . .	35.9	32.5	32.4	31.2	30.4
95 . .	33.1	30.9	30.2	30.2	28.0	95 . .	33.7	31.0	30.3	30.3	28.1
No. of Cases	659	532	523	394	256	No. of Cases	650	532	523	394	242
Median	42.8± .22 P. E.	39.5± .21 P. E.	37.5± .19 P. E.	36.7± .22 P. E.	36.4± .30 P. E.	Median	43.5± .23 P. E.	40.1± .23 P. E.	38.4± .19 P. E.	37.4± .24 P. E.	36.8± .31 P. E.
Q . .	4.4	4.2	3.5	3.5	3.8	Q . .	4.6	4.3	3.5	3.8	4.0

and see how fast you can get it done. When I say 'now,' turn the whole pack over and begin dropping them in just as fast as you can."

The experimenter started the watch after the pack had been turned over, when the child took hold of the first card, and stopped it as he dropped in the last one. The time in seconds and the number and nature of the errors were recorded.

The test is undoubtedly a good one as a simple measure of an eye-hand coördination. The only doubt to be thrown upon it is that it may be modified by defects of color vision. Extreme cases of color blindness are easily detected by the number and nature of the errors, if not by difficulty in naming the colors. Results of color-blind children are of course excluded. The question is whether lesser defects of color vision might cause

TABLE 22—PHYSICAL TESTS: SCALE OF AVERAGE PERCENTILE RANKS

Boys

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	22.1	21.8	23.2	24.0	26.1
10	27.4	27.0	28.7	30.3	32.3
15	31.6	31.7	33.3	34.3	37.7
20	35.1	35.1	36.9	37.2	40.8
25	38.2	38.2	39.7	39.9	42.8
30	40.1	41.0	42.3	42.2	44.8
35	43.5	43.4	44.6	44.6	47.0
40	46.1	45.8	47.0	46.8	49.3
45	48.5	48.1	49.7	49.0	51.4
50	50.7	50.4	52.6	51.2	53.3
55	53.2	52.7	55.6	53.6	55.4
60	55.8	54.9	58.2	55.8	58.1
65	58.5	57.5	60.7	58.0	60.7
70	61.2	60.1	63.4	60.1	62.8
75	63.9	63.5	66.1	63.6	64.0
80	67.4	67.9	69.5	67.0	67.4
85	71.3	72.6	73.0	70.5	69.8
90	75.0	77.6	76.9	75.4	74.0
95	79.9	83.3	82.5	79.2	78.7
No. of Cases . .	868	683	628	484	356
Median	50.7± .60 P. E.	50.4± .61 P. E.	52.6± .66 P. E.	51.2± .68 P. E.	53.3± .73 P. E.
Q	12.9	12.7	13.2	11.9	11.1

a lengthening of the time without becoming evident in the kind of errors. Since the colors were all as pure and as saturated as paper can be made, it is improbable that a lengthened time of perception is an appreciable factor in the result.

The time was recorded in seconds and the accuracy in percentages. These two measures were then combined into an index by dividing the time by the accuracy, giving an estimated time for a perfect performance. Since there were rarely more than two errors, the index does not differ widely from the time.

The index, as an estimated time for a perfect performance, has in it in this case a source of error. The assumption is, of course, that a child who makes errors could have done the sorting without them by taking more time. But since the child is usually conscious of his errors and loses time by becoming disturbed over them, the very making of the error increases the time. The index, therefore, seems to place a double penalty on errors. Regarded as an arbitrary way of penalizing records which contain errors, the index has a meaning.

The results are presented in the form of a five-percentile scale for boys and girls, and for time and index separately (Tables 20 and 21). In taking the average percentile rank for the individual, this test is represented by two measures of seven. The importance of eye-hand coördination as an element in skill, the accuracy of giving and evaluating the test, and its relatively high coördination with factors of school grade and mental ability, seemed to warrant giving it this much weight in the average. The percentile rank in time is one measure and that in the index the other. Errors, if they occur, are thus taken into consideration without penalizing the record unduly.

The Scale of Physical Skill in Terms of Average Percentile Ranks

Among the measures which we have classed in this study as primarily measures of physical powers, all except height and weight contain some element of skill. Mere size, while it is an important element in strength, cannot be interpreted as skill. On the other hand, the dynamometer test, while it is intended as a mere measure of muscular power, really contains an element of skill, in that there is a certain knack in handling the dynamometer correctly and skillfully which is a factor in the outcome. In addition to this, strength is in itself an important physical power. The vital capacity test, while it is intended as a mere measure of lung capacity, proves in the administration of it to contain a decided element of ability to follow directions and of skill in motor coördination. Rate of motion, steadiness, and rate of coördination are obviously skills. Accordingly, in combining measures into a single measure of skill, we have used vital capacity, strength of the hand, steadiness of the hand, rate of tapping, and card-sorting as the separate measures.

The method of summing up the separate measures to form a single measure has been to average for each individual his percentile ranks in the tests enumerated above. Such an average reveals the extent to which an individual tends to be uniformly good, uniformly bad, or distributed in his abilities. It does not reveal anything about the nature of individual variations except to show the tendency toward uniformly good or bad results. If, for instance, an individual were so uniformly poor in physical skills as to have a percentile rank of five in all his separate measures, his average percentile rank for the series would, of course, be five. If, on the other hand, he were so uniformly good as to have a percentile rank of

TABLE 23—PHYSICAL TESTS: SCALE OF AVERAGE PERCENTILE RANKS

Girls

PERCENTILES	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	22.5	24.1	24.4	24.5	26.1
10	28.9	28.8	29.7	30.4	30.2
15	32.5	32.8	33.8	35.1	36.6
20	35.5	35.1	37.5	38.8	40.5
25	39.1	38.3	41.2	42.1	43.6
30	41.5	41.2	44.0	45.2	46.3
35	44.9	43.6	46.6	46.9	48.8
40	47.1	46.0	48.6	47.8	50.7
45	49.4	48.4	50.6	50.6	52.0
50	51.5	50.9	53.0	53.2	53.3
55	53.6	53.3	55.5	55.7	54.7
60	55.9	55.7	57.7	57.9	57.3
65	58.1	58.0	59.9	60.2	60.3
70	60.5	60.3	62.3	62.7	63.2
75	63.5	63.2	64.9	65.2	65.8
80	66.6	66.2	67.5	68.0	67.9
85	69.8	69.6	70.2	71.4	69.9
90	73.4	73.7	74.0	75.5	73.4
95	79.0	78.5	79.9	79.0	78.4
No. of Cases . .	661	533	523	396	245
Median	51.5± .60 P. E.	50.9± .68 P. E.	53.0± .65 P. E.	53.2± .75 P. E.	53.3± .90 P. E.
Q	12.2	12.5	11.9	11.6	11.1

TABLE 24 — PHYSICAL ABILITY: SCALE OF AVERAGE PERCENTILE RANK

Boys — 14 years

Percentiles	Vital Cap.	Strength in Kilograms		Steadiness		Rapidity Number of Taps				Card-Sorting		
	C. C.	R.	L.	R.	L.	R30″	R60″	L30″	L60″	Time	Index	Av. Pct'l Rank
5	1656	17.6	17.0	II- 8	II-10	143	270	114	220	62.9	65.0	22.1
10	1831	19.4	18.9	III-10	II- 5	151	285	121	228	58.4	60.9	27.4
15	1933	20.7	20.0	III- 7	II- 1	155	295	126	235	55.7	58.1	31.6
20	2019	21.9	21.0	III- 4	III-11	159	303	129	242	54.1	55.7	35.1
25	2072	22.8	22.0	III- 1	III- 9	163	308	132	248	52.6	54.2	38.2
30	2127	23.5	22.8	IV-12	III- 7	166	313	135	254	51.2	52.9	40.1
35	2180	24.3	23.5	IV-10	III- 6	169	318	138	260	49.9	51.7	43.5
40	2233	24.9	24.1	IV- 8	III- 4	171	322	140	264	48.8	50.5	46.1
45	2284	25.5	24.7	IV- 6	III- 2	174	327	143	269	47.7	49.4	48.5
50	2336	26.1	25.3	IV- 4	III- 1	176	331	145	273	46.7	48.2	50.7
55	2393	26.8	25.9	IV- 3	IV-12	178	336	148	278	45.6	47.0	53.2
60	2454	27.5	26.5	IV- 1	IV- 9	181	340	150	282	44.6	45.9	55.8
65	2526	28.2	27.3	IV- 0	IV- 7	184	346	153	287	43.7	44.6	58.5
70	2600	29.1	28.1	V- 9	IV- 5	186	351	155	291	42.7	43.6	61.2
75	2686	30.1	29.0	V- 5	IV- 3	189	356	158	296	41.8	42.6	63.9
80	2772	31.3	30.0	V-2	IV- 1	193	363	161	302	40.8	41.6	67.4
85	2894	32.5	31.2	VI-11	IV- 0	198	372	166	312	39.7	40.5	71.3
90	3052	34.4	32.9	VI- 4	V- 7	204	383	171	323	37.7	38.7	75.0
95	3376	38.1	36.5	VII- 8	VI- 8	214	399	180	343	35.7	36.2	79.9

TABLE 25 — PHYSICAL ABILITY: SCALE OF AVERAGE PERCENTILE RANK

Boys — 15 years

Percentiles	Vital Cap.	Strength in Kilograms		Steadiness		Rapidity Number of Taps				Card-Sorting		
	C. C.	R.	L.	R.	L.	R30″	R60″	L30″	L60″	Time	Index	Aver. Pct'l Rank
5	1940	21.7	20.7	III-10	II- 3	148	283	121	228	57.4	58.7	21.8
10	2071	23.5	22.5	III- 3	III-11	158	297	128	240	53.8	55.2	27.0
15	2165	24.7	23.6	IV-11	III- 8	162	305	131	247	51.9	53.3	31.7
20	2243	25.8	24.7	IV- 9	III- 5	165	311	134	254	50.0	51.5	35.1
25	2312	26.8	25.6	IV- 7	III- 3	168	317	138	260	48.8	49.9	38.2
30	2380	27.7	26.4	IV- 5	III- 0	171	322	141	265	47.6	48.8	41.0
35	2465	28.6	27.4	IV- 3	IV-11	174	328	143	270	46.4	47.7	43.4
40	2557	29.2	28.4	IV- 1	IV- 9	177	334	145	274	45.3	46.5	45.8
45	2639	29.9	29.2	V-12	IV- 7	179	339	148	276	44.3	45.4	48.1
50	2712	30.8	30.0	V- 9	IV- 6	182	344	150	283	43.4	44.4	50.4
55	2785	32.1	31.0	V- 6	IV- 4	184	349	153	288	42.6	43.4	52.7
60	2856	33.6	32.1	V- 3	IV- 2	187	354	155	293	41.7	42.5	54.9
65	2928	35.0	33.3	V- 0	IV- 0	190	358	157	297	40.8	41.5	57.5
70	2999	36.2	34.6	VI-10	V-11	193	364	160	301	39.9	40.5	60.1
75	3094	38.1	35.7	VI- 6	V- 6	196	370	163	308	38.8	39.4	63.5
80	3188	39.6	36.9	VI- 2	V- 2	200	376	166	314	37.6	38.2	67.9
85	3303	41.2	38.4	VII-10	VI- 9	206	384	170	320	36.5	37.0	72.6
90	3439	43.9	40.4	VII- 2	VI -2	212	397	177	333	35.4	35.8	77.6
95	3699	45.9	42.6	VIII- 4	VII- 4	222	417	186	351	32.8	33.6	83.3

TABLE 26 — PHYSICAL ABILITY: SCALE OF AVERAGE PERCENTILE RANK

Boys — 16 Years

Percentiles	Vital Cap.	Strength in Kilograms		Steadiness		Rapidity Number of Taps				Card-Sorting		
	C. C.	R.	L.	R.	L.	R30″	R60″	L30″	L60″	Time	Index	Aver. Pct'l Rank
5	2217	24.8	23.3	III- 4	III-12	154	295	126	242	53.7	55.0	23.2
10	2395	27.2	25.9	IV-10	III-10	163	307	133	250	50.3	52.5	28.7
15	2514	29.4	27.7	IV- 7	III- 8	167	315	137	259	48.4	50.0	33.3
20	2623	30.8	29.1	IV- 2	III- 6	171	323	141	265	46.7	48.0	36.9
25	2706	31.9	30.3	V-11	IV-12	174	329	144	271	45.0	46.0	39.7
30	2789	33.2	31.3	V- 9	IV-10	177	335	146	276	44.1	44.7	42.3
35	2871	34.4	32.3	V- 6	IV- 9	180	341	149	282	43.2	43.9	44.6
40	2953	35.3	33.4	VI-12	IV- 8	183	346	152	287	42.3	43.1	47.0
45	3038	36.2	34.9	VI-11	IV- 6	185	351	154	292	41.4	42.3	49.7
50	3128	37.3	35.3	VI- 9	IV- 0	188	355	157	297	40.5	41.5	52.6
55	3213	38.5	36.0	VI- 8	V-11	190	360	159	303	39.7	40.7	55.6
60	3281	39.7	37.0	VI- 6	V- 9	193	366	162	308	38.9	39.8	58.2
65	3348	40.9	38.1	VI- 1	V- 7	196	372	165	313	38.1	38.7	60.7
70	3421	42.1	39.4	VII-11	VI-12	199	377	167	318	37.3	37.6	63.4
75	3520	43.8	40.8	VII- 8	VI-10	203	384	170	324	36.5	36.5	66.1
80	3625	45.3	42.3	VII- 6	VI- 7	207	392	175	332	35.7	35.5	69.5
85	3765	46.6	44.1	VIII-11	VI- 4	212	399	180	340	34.7	34.1	73.0
90	3948	49.2	46.3	VIII- 7	VII- 8	220	414	188	354	32.8	32.6	76.9
95	4171	52.3	48.2	IX-10	VIII- 9	232	438	199	376	30.9	31.1	82.5

TABLE 27 — PHYSICAL ABILITY: SCALE OF AVERAGE PERCENTILE RANK

Boys — 17 Years

Percentiles	Vital Cap.	Strength in Kilograms		Steadiness		Rapidity Number of Taps				Card-Sorting		
	C. C.	R.	L.	R.	L.	R30″	R60″	L30″	L60″	Time	Index	Aver. Pct'l Rank
5	2536	31.3	29.4	IV-10	III- 7	156	300	125	243	51.7	53.6	24.0
10	2702	34.0	31.4	IV- 6	IV-11	163	310	132	254	48.8	49.6	30.3
15	2826	36.1	33.4	V-10	IV-10	168	320	137	263	47.0	48.0	34.3
20	2913	38.1	35.2	V- 7	IV- 8	172	327	142	270	45.1	46.4	37.2
25	3001	39.5	36.6	VI-12	IV- 6	175	333	145	276	44.2	44.9	39.9
30	3103	40.7	37.6	VI-11	V-12	178	339	148	282	43.3	44.3	42.2
35	3204	41.5	38.6	VI-10	V-10	181	344	151	287	42.3	43.0	44.6
40	3279	42.4	39.5	VI- 8	V- 9	184	349	153	292	41.4	42.0	46.8
45	3355	43.3	40.4	VI- 7	V- 7	186	354	156	297	40.5	41.0	49.0
50	3433	44.1	41.4	VI- 4	VI-12	189	359	159	303	39.7	40.1	51.2
55	3514	45.2	42.4	VII-11	VI-11	192	365	161	309	38.9	39.3	53.6
60	3597	46.3	43.2	VII-10	VI- 9	195	370	164	315	38.2	38.6	55.8
65	3668	47.3	44.1	VII- 8	VI- 8	198	376	167	321	37.5	37.8	58.0
70	3739	48.6	45.1	VII- 7	VI- 6	200	382	170	326	36.8	37.0	60.1
75	3817	50.0	46.4	VII- 0	VI- 0	204	390	174	332	36.0	36.3	63.6
80	3931	51.2	47.7	VIII-11	VII-10	208	398	177	338	35.3	35.5	67.0
85	4062	52.2	49.1	VIII- 8	VII- 8	214	409	182	348	34.0	34.5	70.5
90	4221	54.0	50.7	VIII- 6	VII- 3	221	423	189	360	32.5	32.8	75.4
95	4392	56.1	53.4	IX-10	VIII- 8	234	449	200	377	31.1	31.1	79.2

TABLE 28—PHYSICAL ABILITY: SCALE OF AVERAGE PERCENTILE RANK

Boys — 18 Years

Per-centiles	Vital Cap.	Strength in Kilograms		Steadiness		Rapidity Number of Taps				Card-Sorting		
	C. C.	R.	L.	R.	L.	R30″	R60″	L30″	L60″	Time	Index	Aver. Pct'l Rank
5	2744	34.5	31.9	V-12	IV-10	161	319	129	249	53.3	55.1	26.1
10	2893	38.1	34.6	V- 9	IV- 8	167	327	136	261	48.4	50.3	32.3
15	3002	40.0	36.2	V- 6	IV- 5	171	334	141	271	46.1	48.2	37.7
20	3073	41.1	37.8	VI-12	V-11	174	341	144	276	44.5	46.2	40.8
25	3143	42.0	39.0	VI- 9	V-10	177	347	147	281	43.5	44.6	42.8
30	3219	43.0	40.0	VI- 7	V- 8	180	352	150	285	42.5	43.6	44.8
35	3319	44.2	41.2	VI- 5	V- 6	183	357	152	290	41.6	42.7	47.0
40	3417	44.9	42.4	VII-11	VI-12	186	362	154	294	40.6	41.7	49.3
45	3503	45.6	43.3	VII-10	VI-10	188	366	157	298	39.7	40.8	51.4
50	3589	46.2	44.3	VII- 9	VI- 9	191	371	159	302	39.0	40.1	53.3
55	3671	46.9	45.0	VII- 7	VI- 7	193	377	162	308	38.2	39.1	55.4
60	3753	47.8	45.6	VII- 6	VI- 6	195	382	164	313	37.5	38.3	58.1
65	3848	48.8	46.3	VII- 0	VII-12	198	386	167	318	36.7	37.5	60.7
70	3963	49.9	47.1	VIII-10	VII-10	201	391	169	323	36.0	36.7	62.8
75	4062	51.0	48.1	VIII- 9	VII- 8	205	398	173	328	35.2	36.0	64.0
80	4153	51.9	49.2	VIII- 7	VII- 6	209	408	177	334	34.1	35.3	67.4
85	4268	53.2	50.3	VIII- 6	VII- 1	214	418	182	343	32.8	33.7	69.8
90	4413	55.1	52.0	IX-11	VIII- 8	220	431	189	355	31.6	32.1	74.0
95	4617	58.0	54.6	IX- 7	VIII- 5	231	456	197	377	30.3	30.5	78.7

TABLE 29—PHYSICAL ABILITY: SCALE OF AVERAGE PERCENTILE RANK

Girls — 14 Years

Per-centiles	Vital Cap.	Strength in Kilograms		Steadiness		Rapidity Number of Taps				Card-Sorting		
	C. C.	R.	L.	R.	L.	R30″	R60″	L30″	L60″	Time	Index	Aver. Pct'l Rank
5	1401	15.8	15.5	III-11	II- 8	145	277	113	213	55.9	57.8	22.5
10	1589	18.3	17.2	III- 7	II- 1	151	286	121	227	52.6	53.8	28.9
15	1721	19.3	18.6	III- 3	III-10	155	293	125	236	50.0	51.7	32.5
20	1818	20.1	19.3	III- 0	III- 8	159	300	128	243	48.7	49.8	35.5
25	1863	20.8	20.0	IV-10	III- 6	162	304	131	247	47.4	48.6	39.1
30	1909	21.4	20.7	IV- 8	III- 4	164	308	134	252	46.2	47.4	41.5
35	1955	22.0	21.3	IV- 6	III- 2	167	312	136	257	45.0	46.2	44.9
40	2001	22.7	21.8	IV- 4	III- 0	169	317	139	261	44.3	45.0	47.1
45	2047	23.5	22.3	IV- 2	IV-11	171	321	141	265	43.5	44.3	49.4
50	2093	24.3	23.0	IV- 0	IV- 9	173	325	144	269	42.8	43.5	51.5
55	2140	24.9	23.6	V-11	IV- 7	175	330	146	273	42.0	42.7	53.6
60	2186	25.4	24.3	V- 9	IV- 6	177	335	148	278	41.3	42.0	55.9
65	2237	26.0	24.9	V- 6	IV- 4	179	340	151	283	40.5	41.2	58.1
70	2290	26.6	25.6	V- 3	IV- 2	182	345	154	288	39.6	40.4	60.5
75	2343	27.5	26.2	V- 1	IV- 1	185	350	156	293	38.6	39.4	63.5
80	2396	28.3	26.9	VI- 9	V-10	188	356	159	298	37.6	38.2	66.6
85	2489	29.2	27.9	VI- 5	V- 5	192	362	163	306	36.5	37.0	69.8
90	2584	30.1	29.0	VI- 1	V- 1	198	372	168	315	35.4	35.9	73.4
95	2749	31.6	30.5	VII- 6	VI- 6	205	385	176	331	33.9	33.7	79.0

TABLE 30—PHYSICAL ABILITY: SCALE OF AVERAGE PERCENTILE RANK

Girls—15 Years

Percentiles	Vital Cap.	Strength in Kilograms		Steadiness		Rapidity Number of Taps				Card-Sorting		
	C. C.	R.	L.	R.	L.	R30″	R60″	L30″	L60″	Time	Index	Aver. Pct'l Rank
5 .	1715	19.4	17.9	III- 3	III-11	149	281	116	223	51.0	53.9	24.1
10 .	1837	21.3	19.6	IV-10	III- 8	155	294	123	238	48.5	49.9	28.8
15 .	1909	22.7	20.8	IV- 8	III- 4	160	303	129	245	46.7	48.0	32.8
20 .	1980	23.5	21.7	IV- 5	III- 0	162	307	132	251	45.0	46.1	35.1
25 .	2030	24.3	22.5	IV- 3	IV-10	165	312	135	257	44.0	44.7	38.3
30 .	2072	24.9	23.1	IV- 0	IV- 8	167	316	137	262	43.1	43.7	41.2
35 .	2114	25.4	23.7	V-10	IV- 7	170	321	140	266	42.2	42.8	43.6
40 .	2157	26.0	24.2	V- 7	IV- 5	172	325	142	270	41.3	41.9	46.0
45 .	2199	26.5	24.8	V- 4	IV- 3	174	329	145	274	40.4	41.0	48.4
50 .	2255	27.1	25.4	V- 2	IV- 1	176	333	147	278	39.5	40.1	50.9
55 .	2312	27.7	25.9	VI-12	V-12	178	337	149	282	38.8	39.3	53.3
60 .	2369	28.3	26.5	VI- 8	V- 9	180	342	152	287	38.1	38.5	55.7
65 .	2429	28.9	27.1	VI- 5	V- 6	182	347	154	292	37.2	37.7	58.0
70 .	2493	29.5	27.8	VI- 2	V- 3	185	352	156	296	36.5	36.9	60.3
75 .	2557	30.1	28.4	VII-11	V- 1	188	357	159	301	35.7	36.1	63.2
80 .	2624	30.8	29.1	VII- 6	VI- 9	192	363	162	307	34.8	35.3	66.2
85 .	2698	31.2	29.8	VII- 1	VI- 4	197	371	166	314	33.5	34.0	69.6
90 .	2773	32.5	30.4	VIII- 8	VII-11	202	380	171	321	32.2	32.5	73.7
95 .	2960	33.4	32.8	VIII- 1	VIII-10	209	395	178	335	30.9	31.0	78.5

TABLE 31—PHYSICAL ABILITY: SCALE OF AVERAGE PERCENTILE RANK

Girls—16 Years

Percentiles	Vital Cap.	Strength in Kilograms		Steadiness		Rapidity Number of Taps				Card-Sorting		
	C. C.	R.	L.	R.	L.	R30″	R60″	L30″	L60″	Time	Index	Aver. Pct'l Rank
5 .	1778	20.7	19.4	IV-12	III-11	155	293	122	232	47.2	48.8	24.4
10 .	1915	22.3	20.9	IV- 8	III- 6	162	305	130	244	44.5	45.9	29.7
15 .	2017	23.3	21.8	IV- 4	IV-12	164	312	133	250	43.3	43.8	33.8
20 .	2074	24.2	22.8	V-12	IV-11	167	319	136	257	42.2	43.1	37.5
25 .	2130	25.0	23.2	V-11	IV- 9	170	323	139	263	41.1	42.3	41.2
30 .	2186	25.7	23.7	V- 9	IV- 8	172	326	142	268	40.0	41.5	44.0
35 .	2239	26.4	24.3	V- 7	IV- 6	174	329	144	274	39.4	40.6	46.6
40 .	2290	27.0	24.8	V- 6	IV- 4	176	333	147	279	33.8	39.8	48.6
45 .	2341	27.5	25.4	VI-12	V-12	178	336	149	284	38.2	39.1	50.6
50 .	2392	28.1	26.0	VI-10	V-10	180	339	152	288	37.5	38.4	53.0
55 .	2443	28.7	26.7	VI- 8	V- 8	182	344	154	292	36.9	37.7	55.5
60 .	2494	29.2	27.4	VI- 7	V- 7	185	348	156	295	36.3	37.2	57.7
65 .	2544	29.7	28.1	VI- 2	VI-12	188	353	158	299	35.7	36.6	59.9
70 .	2595	30.3	28.9	VII-11	VI-10	190	357	160	304	35.1	36.0	62.3
75 .	2664	30.9	29.5	VII- 8	VI- 8	194	362	163	309	34.2	35.3	64.9
80 .	2736	31.6	30.3	VII- 6	VI- 6	197	369	166	315	33.2	34.5	67.5
85 .	2813	32.3	31.2	VIII-10	VII-11	200	375	170	320	32.2	33.6	70.2
90 .	2946	33.8	32.1	VIII- 6	VII- 9	205	383	175	331	31.2	32.4	74.0
95 .	3126	36.1	33.6	IX- 9	VIII- 8	214	398	183	346	30.2	30.3	79.9

TABLE 32

PHYSICAL ABILITY: SCALE OF AVERAGE PERCENTILE RANK

Girls — 17 years

Per-centiles	Vital Cap.	Strength in Kilograms		Steadiness		Rapidity Number of Taps				Card-Sorting		
	C. C.	R.	L.	R.	L.	R30″	R60″	L30″	L60″	Time	Index	Aver. Pct'l Rank
5 .	1836	22.9	20.7	IV-10	III-10	157	301	126	241	47.4	49.3	24.5
10 .	1940	24.8	22.3	IV- 7	IV-12	162	309	132	251	44.3	45.9	30.4
15 .	2042	25.8	23.4	V-12	IV-11	165	316	135	261	42.9	44.1	35.1
20 .	2140	26.7	24.3	V-10	IV- 9	169	322	139	266	41.5	42.6	38.8
25 .	2220	27.3	25.1	V- 8	IV- 7	171	326	142	270	40.1	41.3	42.1
30 .	2271	28.0	25.7	V- 4	IV- 6	174	331	144	275	39.5	40.0	45.2
35 .	2323	28.5	26.4	VI-11	IV- 0	176	335	146	280	38.8	39.4	46.9
40 .	2374	29.0	27.0	VI-10	V-11	178	340	148	284	38.1	38.7	47.8
45 .	2424	29.4	27.6	VI- 8	V- 9	181	344	150	288	37.4	38.0	50.6
50 .	2473	29.9	28.2	VI- 7	V- 8	183	348	152	291	36.7	37.4	53.2
55 .	2521	30.3	28.8	VI- 3	V- 6	185	352	155	295	36.1	36.7	55.7
60 .	2569	30.8	29.3	VII-11	VI-11	187	356	157	299	35.4	36.0	57.9
65 .	2624	31.4	29.8	VII- 9	VI- 9	189	361	159	304	34.7	35.3	60.2
70 .	2691	31.9	30.4	VII- 7	VI- 7	191	366	162	309	33.9	34.6	62.7
75 .	2758	32.5	31.0	VII- 5	VI- 2	195	371	165	314	33.2	33.7	65.2
80 .	2839	33.5	31.7	VIII-11	VII-10	198	376	169	320	32.4	32.9	68.0
85 .	2881	34.6	32.5	VIII- 8	VII- 7	201	383	173	326	31.7	32.0	71.4
90 .	3061	36.5	33.6	VIII- 4	VIII-10	207	394	177	338	30.9	31.2	75.5
95 .	3114	39.2	35.8	IX- 8	VIII- 3	215	412	185	353	30.2	30.3	79.0

TABLE 33

PHYSICAL ABILITY: SCALE OF AVERAGE PERCENTILE RANK

Girls — 18 Years

Per-centiles	Vital Cap.	Strength in Kilograms		Steadiness		Rapidity Number of Taps				Card-Sorting		
	C. C.	R.	L.	R.	L.	R30″	R60″	L30″	L60″	Time	Index	Aver. Pct'l Rank
5 .	1742	23.2	20.0	IV- 7	III- 7	156	312	125	243	46.8	48.7	26.1
10 .	1916	24.6	22.0	IV- 0	IV-11	162	323	132	252	44.2	45.0	30.2
15 .	2029	25.5	23.2	V- 9	IV-10	167	331	136	259	42.9	43.6	36.6
20 .	2106	26.4	24.3	V- 5	IV- 8	171	337	141	267	41.5	42.3	40.5
25 .	2182	27.0	25.0	VI-11	IV- 6	173	341	143	274	40.2	40.9	43.6
30 .	2246	27.5	25.6	VI-10	IV- 0	175	345	145	279	39.4	39.8	46.3
35 .	2305	28.0	26.1	VI- 8	V-11	177	348	148	283	38.6	39.1	48.8
40 .	2365	28.6	26.8	VI- 6	V- 8	179	351	150	287	37.9	38.3	50.7
45 .	2420	29.1	27.5	VI- 3	V- 7	181	355	152	291	37.1	37.5	52.0
50 .	2469	29.6	28.1	VII-11	V- 5	183	359	154	295	36.4	36.8	53.3
55 .	2518	30.2	28.7	VII-10	VI-11	185	362	156	299	35.6	36.0	54.7
60 .	2567	30.7	29.2	VII- 8	VI- 8	186	365	158	303	34.8	35.3	57.3
65 .	2620	31.4	29.8	VII- 6	VI- 6	188	368	160	307	34.1	34.5	60.3
70 .	2682	32.0	30.2	VII- 2	VII-11	190	371	163	311	33.3	33.6	63.2
75 .	2744	32.8	30.9	VIII-11	VII- 9	193	376	166	315	32.6	32.9	65.8
80 .	2807	33.9	31.6	VIII- 8	VII- 6	197	383	169	320	31.8	32.0	67.9
85 .	2890	35.0	32.4	VIII- 6	VIII-11	201	391	173	328	31.1	31.6	69.9
90 .	2973	36.3	33.8	IX-11	VIII- 7	209	405	179	338	30.3	30.4	73.4
95 .	3161	38.7	35.9	IX- 7	IX-10	220	432	189	357	28.0	28.1	78.4

one hundred, his average percentile rank would be one hundred. If his results varied above and below the median, his average percentile rank would be toward the middle region of values. While no individual was so uniformly good or bad as to reach the theoretical limit of a percentile rank of five or of one hundred, nevertheless the distribution of the percentile averages was sufficiently great to show a decided tendency toward a characteristic range of physical abilities for the individual which makes the average percentile rank a measure of value. Each year the poorest 5 per cent in the scale falls below an average percentile rank of about twenty-five, and the best 5 per cent rises above an average percentile rank of about eighty (see Tables 22 and 23). There were nine records in which the average percentile rank in physical tests fell below ten, and five records in which it rose above ninety-five. The distribution of average percentile ranks each year corresponded very well with the normal distribution curve (see Tables 50 and 51). It is of course true that for many purposes the psychogram, showing the exact range of variation in the tests of an individual, is a much more significant thing than an average percentile rank. Nevertheless, it was important for us to obtain a single, though admittedly a rough, measure of excellence in this type of performance, which could be used in finding correlations between ability in physical tests and various other factors, such as ability in mental tests, earning capacity, regularity of employment, and grade of home.

In making up the scale, it was necessary to decide just which of the measures of the various tests to use in taking an average, since several of them have more than one measure. The tests of rapidity and of coördination seemed to us to deserve more weight in the average than the others, since they are more obviously tests of skill. Steadiness was less satisfactory because both the method of giving it and the type of measure obtained left much to be desired in point of scientific accuracy. Strength is supposed to be a mere measure of muscular power, but there is an undoubted element of skill in the method of handling the dynamometer. Vital capacity, intended as a pure measure of lung capacity, proves in the administration to show a decided element of skill of performance. Our final decision as to the make up of the scale of average percentile rank was as follows:

Vital Capacity	1 measure
Strength—median between percentile ranks for right and left hand	1 measure
Steadiness—median between percentile ranks for right and left hand	1 measure
Rapidity of Motion (tapping—median between percentile ranks of right hand in 30 seconds and in 60 seconds	1 measure
same for left hand	1 measure
Card-Sorting—time	1 measure
index	1 measure
	7 measures

The value which appears in the final scale of physical abilities is the average of these seven measures (Tables 22 and 23). In order to make the method of forming the scale perfectly clear, the following table is an individual score, with the derivation of the final value for that individual.

ILLUSTRATIVE CASE FOR FINDING AVERAGE PERCENTILE RANK IN PHYSICAL ABILITY

No. 547 M

Test	*Score*	*Percentile Ranks*	*Weighted Percentile Ranks*
Vital Capacity	2500	90	90
Strength			
Right Hand	29	85	
Left Hand	30	95	90
Steadiness			
Right Hand	III-6	15	
Left Hand	III-7	25	20
Tapping			
Right Hand—30″	175	55	
Right Hand—60″	321	45	50
Left Hand— 30″	185	100	
Left Hand—60″	343	100	100
Card-Sorting			
Time	41.6	65	65
Index	42.5	60	60
			7)475
Average Percentile Rank			67.9

There were some instances in which not all of the seven measures were present. In making up the final scale, no individual's results were included unless there were as many as four measures to be averaged. For convenience in using the scales to measure individual children, all of the scales for a given year and sex have been arranged in one table (see Tables 24 to 33). This makes it possible to obtain the average percentile rank of a child by reference to one table instead of to seven.

References

(1) Whipple, Guy M.—*Manual of Mental and Physical Tests,* Part I: Simpler Processes. Baltimore: Warwick & York, 1914.

(2) Baldwin, Bird T.—*The Physical Growth of Children from Birth to Maturity.* Iowa City: University of Iowa, 1922.

(3) Woolley, Helen Thompson and Fischer, Charlotte Rust—"Mental and Physical Measurements of Working Children," *Psychological Monographs,* 1914, No. 77. Psychological Review Publishing Co., Princeton, N. J.

APPENDIX TO CHAPTER III

DISTRIBUTION TABLES UPON WHICH THE PERCENTILE TABLES OF CHAPTER III ARE BASED

TABLE 34

DISTRIBUTIONS: HEIGHT

Boys

Centimeters	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
135.6–	7	1			
135.6–139.5 . . .	23	5	1		
139.6	55	13	3		
143.6	124	23	11		
147.6	164	71	11	2	
151.6	166	90	34	4	2
155.6	131	131	70	18	6
159.6	96	125	111	53	30
163.6	49	102	140	110	59
167.6	23	72	114	117	96
171.6	12	35	78	104	80
175.6		14	39	52	52
179.6			11	17	18
183.6			7	7	10
187.6				1	
No. of Cases . .	850	682	630	485	353

TABLE 35

DISTRIBUTIONS: HEIGHT

Girls

Centimeters	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
135.6–139.5 . . .	1				
139.6	4	6			
143.6	16	13	9	6	3
147.6	52	54	33	12	6
151.6	125	118	72	50	27
155.6	155	154	137	102	50
159.6	163	100	145	105	68
163.6	102	71	83	80	46
167.6	34	15	33	33	25
171.6	9	4	10	9	6
175.6	1	1	2	2	1
179.6					
183.6					
No. of Cases . .	662	536	524	399	232

TABLE 36

DISTRIBUTIONS: WEIGHT

Boys

Kilograms	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
30–	13				
30–33.9	64	16	5		
34	137	40	13		
38	200	81	24	4	
42	174	117	55	15	8
46	121	122	92	36	13
50	61	122	112	69	33
54	53	127	182	119	77
58	20	39	102	114	86
62				73	63
66	3	17	34	36	49
70	3		7	8	13
74				4	6
78			1	2	
82 plus			3	3	1
No. of Cases	849	681	630	483	349

TABLE 37

DISTRIBUTIONS: WEIGHT

Girls

Kilograms	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
30–	2				
30–33.9	19				
34	64	19	3		
38	113	46	32	9	7
42	152	89	60	29	19
46	152	140	118	83	45
50	86	113	121	98	52
54	45	85	127	76	57
58	15	27	40	57	24
62				19	5
66	11	12	13	16	9
70	3	4	9	5	6
74		2		3	1
78			2	1	1
82 plus			4	3	2
No. of Cases	662	537	529	399	228

TABLE 38 — DISTRIBUTIONS: VITAL CAPACITY

Boys

Cubic Centimeters	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
1200–	3				
1201–1400	11				
1401	16	7			
1601	40	7	7	2	
1801	81	28	7	1	
2001	153	71	13	3	1
2201	161	98	34	2	5
2401	113	73	51	16	3
2601	96	92	72	27	9
2801	60	94	73	43	28
3001	36	71	67	37	44
3201	28	57	89	50	31
3401	16	31	61	46	36
3601	12	17	43	53	38
3801		16	30	33	27
4001		9	26	24	34
4201			13	22	22
4401			5	11	16
4601			5	6	6
4801			3	1	5
5001–					5
No of Cases	826	671	599	377	310

TABLE 39 — DISTRIBUTIONS: VITAL CAPACITY

Girls

Cubic Centimeters	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
1001–1200	12				
1201	20				
1401	34	10			
1601	50	28	25	11	11
1801	140	74	38	32	14
2001	139	124	83	34	25
2201	121	92	91	65	32
2401	67	82	92	69	39
2601	36	70	65	50	31
2801	14	21	35	32	23
3001	4	19	22	25	8
3201	4	2	8	8	3
3401		1	4	4	1
3601	1		3	2	3
3801				2	1
4001					
No. of Cases	642	523	466	334	191

TABLE 40 — DISTRIBUTIONS: STRENGTH OF THE HAND

Boys

Kilograms	Right Hand					Left Hand				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10.6–12.5	3					2				
12.6	4					9	1			
14.6	17	2				22	4	1		
16.6	31	3	1			34	3	2		
18.6	61	12	4			80	18	7		
20.6	75	21	5			81	32	10		
22.6	116	43	18			134	53	25	3	
24.6	138	56	15	2		139	69	24	8	2
26.6	114	68	30	6		108	58	37	3	2
28.6	86	83	42	8	3	84	74	53	19	7
30.6	66	43	52	17	5	57	52	59	27	8
32.6	45	37	48	17	8	26	46	55	19	13
34.6	26	51	68	23	10	21	54	81	32	21
36.6	17	27	53	23	8	19	38	53	45	21
38.6	13	43	50	36	20	8	30	44	51	33
40.6	7	27	50	52	36	15	29	42	46	27
42.6	10	17	33	53	28		6	32	54	36
44.6	9	54	47	39	53		23	26	35	51
46.6			23	41	36			33	34	35
48.6			33	33	28			5	31	25
50.6			11	43	34			21	20	22
52.6			9	22	19				27	11
54.6			8	21	13					17
56.6			9	9	9					
58.6				10	14					
60.6										
No. of Cases	838	587	609	455	324	839	590	610	454	331

TABLE 41 — DISTRIBUTIONS: STRENGTH OF THE HAND

Girls

Kilograms	Right Hand					Left Hand				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs
10.6–12.5	4					5				
12.6	11					9	1	1		
14.6	28	6	1			37	10	3	3	2
16.6	25	8	8			44	17	8	3	6
18.6	80	20	12	4	1	89	33	27	11	3
20.6	106	27	32	11	4	120	51	54	23	13
22.6	81	59	54	16	15	99	81	91	39	19
24.6	121	83	68	36	22	107	79	83	56	35
26.6	74	78	88	59	39	70	73	68	59	30
28.6	75	75	92	82	39	44	66	68	71	41
30.6	34	53	70	67	32	24	19	56	50	27
32.6	11	24	28	35	19	5	16	22	27	13
34.6	3	10	19	20	16	2	8	11	11	8
36.6	2	6	11	14	8	2	1	2	6	2
38.6		5	8	11	7			1	6	4
40.6		1	1	5	3			1	2	2
42.6	1		1	5	1					
44.6				1						
No. of Cases	656	455	493	366	206	657	455	496	367	205

TABLE 42 — DISTRIBUTIONS: STEADINESS OF THE HAND

Boys

Hole	No. of Contacts	Right Hand					Left Hand				
		14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
I. .	12–6	5					19	1			
	5–0										
II. .	12–6	36	12	1			91	30	14	5	
	5–0	15	8	1			28	17	3		
III. .	12–6	140	43	27	5	1	241	123	51	22	
	5–0	42	22	8	1		66	38	14	5	5
IV. .	12–6	250	167	75	41	9	223	205	164	92	45
	5–0	53	33	21	7	6	38	32	24	11	10
V. .	12–6	141	137	95	51	42	65	95	121	90	68
	5–0	16	13	13	9	5	6	1	6	6	3
VI. .	12–6	77	105	148	116	57	29	58	111	109	79
	5–0	6	5	16	11	4	3	2	11	10	3
VII. .	12–6	24	54	99	99	87	10	27	43	65	69
	5–0	2	2	4	9	7			6	6	3
VIII. .	12–6	13	29	61	78	73	5	9	25	28	34
	5–0	1		10	8	6	1	2	1	1	1
IX. .	12–6	10	22	26	26	31	4	12	18	14	13
	5–0			13	3	6			4		1
No. of Cases		831	652	618	464	334	829	652	616	464	334

TABLE 43 — DISTRIBUTIONS: STEADINESS OF THE HAND

Girls

Hole	No. of Contacts	Right Hand					Left Hand				
		14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
I. .	12–6						11	2	3		
	5–0										
II. .	12–6	15	3	2	2		40	16	12	13	
	5–0	6	2	1	1		21	3	5		
III. .	12–6	77	18	11	5	3	146	63	32	15	11
	5–0	33	12	5	2	1	57	24	14	7	4
IV. .	12–6	180	103	52	31	9	202	146	131	75	39
	5–0	39	26	25	10	8	24	31	25	16	6
V. .	12–6	133	105	113	54	19	82	113	94	73	39
	5–0	11	15	8	6	6	9	6	3	5	2
VI. .	12–6	98	96	108	79	40	41	52	91	59	30
	5–0	9	4	12	11	9	3	9	7	8	2
VII. .	12–6	34	69	75	65	39	5	25	51	38	28
	5–0	3	2	2	5	8		1	3	2	2
VIII. .	12–6	6	47	50	47	28	3	18	20	26	18
	5–0	1		3	6	5			4	3	
IX. .	12–6	6	21	38	23	17	1	11	10	13	14
	5–0			6	8	5			5	3	
No. of Cases		651	523	511	355	197	645	520	510	356	195

TABLE 44—DISTRIBUTIONS: RAPIDITY OF MOVEMENT OF THE HAND 30-SECOND PERIOD

Boys

No. of Taps	Right Hand					Left Hand				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
100–						5				
101–110						17	1	2	2	1
111	1	1	1			43	25	12	5	5
121	7	4	2			96	65	33	34	12
131	17	6	4	3		153	99	77	41	29
141	45	28	17	8	3	156	144	115	78	58
151	94	37	26	20	10	155	138	118	89	72
161	133	110	70	48	33	83	105	109	83	68
171	169	127	105	80	54	46	44	60	62	39
181	145	134	124	84	68	15	30	35	34	28
191	86	94	100	85	70	16	15	26	21	20
201	50	60	72	62	40	6	7	12	10	6
211	27	34	37	30	32	2	1	7	8	4
221	17	36	25	52	5	1		5	4	
231	8	4	15		6				1	
241		2	6		6					
251			11							
261					3					
271										
281										
291					3					
301										
No. of Cases	799	677	615	472	343	794	674	611	472	342

TABLE 45—DISTRIBUTIONS: RAPIDITY OF MOVEMENT OF THE HAND 60-SECOND PERIOD

Boys

No. of Taps	Right Hand					Left Hand				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
200–						14			1	
201–220	1	4	1			24	13	6	2	
221	2					107	54	21	14	6
241	15	6	2	3		134	247	73	42	27
261	43	17	14	4	2	175	145	108	74	49
281	77	49	26	16	10	172	114	119	92	82
301	158	106	79	47	29	81	53	122	79	65
321	179	128	110	76	55	43	28	74	83	58
341	147	141	126	96	72	24	11	40	38	26
361	87	113	108	84	71	12	9	24	27	16
381	50	54	68	59	39	6	1	12	8	9
401	23	30	42	39	30			4	7	4
421	7	15	12	19	14	1		4	4	1
441	4	12	13	17	11			4		
461	3	2	8	6	5				1	
481 plus			3	8	5					
No. of Cases	796	677	612	474	343	793	675	611	472	343

TABLE 46—DISTRIBUTIONS: RAPIDITY OF MOVEMENT OF THE HAND 30-SECOND PERIOD

Girls

No. of Taps	Right Hand					Left Hand				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
100–						8				1
101–110	1				1	11	7	4	3	
111	1	3			1	34	30	17	6	2
121	2	2	1	2	1	85	48	37	19	17
131	10	7	5			123	98	93	56	28
141	36	16	7	7	1	135	116	104	91	47
151	86	51	35	16	14	111	111	119	86	62
161	128	106	95	62	28	67	63	83	58	43
171	152	139	132	85	55	30	39	38	42	20
181	100	88	98	91	72	13	12	10	17	11
191	59	59	84	65	32	4	5	7	6	7
201	37	36	38	36	15	2	2	7	4	3
211	10	16	14	17	11			3	1	1
221	3	7	6	11	7			1		
231		1	3		3					
241			5		1					
261			2		1					
271										
281										
291										
No. of Cases	625	531	525	392	243	623	531	523	389	242

TABLE 47—DISTRIBUTIONS: RAPIDITY OF MOVEMENT OF THE HAND 60-SECOND PERIOD

Girls

No. of Taps	Right Hand					Left Hand				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
200–						12	4		1	2
201–220	2					29	16	9	4	
221	2	6	1	1	3	64	37	30	13	7
241	8	4	2	1		137	89	83	38	29
261	23	15	5	4		149	129	96	79	36
281	90	39	27	10	7	119	116	133	104	63
301	150	115	70	54	24	70	84	99	74	58
321	135	131	159	89	59	24	36	43	42	25
341	113	103	115	93	76	16	14	16	23	12
361	62	65	82	75	36	5	4	4	6	7
381	30	35	41	38	17			6	2	2
401	7	12	11	12	8			3	3	1
421	2	4	5	8	7					
441		2	2	5	4			1		
461			3	1	1					
481 plus			1	1	1					
No. of Cases	624	531	524	392	243	625	529	523	389	242

TABLE 48

DISTRIBUTIONS: CARD-SORTING

Boys

Seconds	Time in Seconds					Index in Seconds				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
30.0–	4	5	16	9	14	4	5	10	8	14
30.1–35	26	54	83	78	71	18	42	105	69	59
35.1	107	151	194	162	119	85	137	144	153	115
40.1	228	194	175	127	88	197	171	193	122	87
45.1	198	143	89	63	33	177	149	79	73	40
50.1	153	86	44	24	17	172	92	61	24	17
55.1	80	26	11	2	6	84	47	12	9	7
60.1	33	14	8	3	3	50	14	18	3	5
65.1	17	4	1	1	2	24	3		5	3
70.1	11	2	1	1	1	13	3			3
75.1						4				
No. of Cases	857	679	622	470	354	828	663	622	466	350

TABLE 49

DISTRIBUTIONS: CARD-SORTING

Girls

Seconds	Time in Seconds					Index in Seconds				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
30.0–	3	9	22	18	22	3	11	16	15	20
30.1–35	49	104	130	130	85	41	89	139	116	74
35.1	162	171	212	146	84	137	166	167	147	80
40.1	217	145	117	72	48	211	145	150	72	45
45.1	129	73	32	18	12	136	71	34	29	15
50.1	63	19	6	8	4	77	31	13	11	6
55.1	20	6	1	1	1	23	12	1	3	1
60.1	6	3				7	4	3		1
65.1	4		3	1		8	1		1	
70.1	6	2				2	2			
75.1 plus						5				
No. of Cases	659	532	523	394	256	650	532	523	394	242

TABLE 50
DISTRIBUTIONS: PHYSICAL TESTS—AVERAGE PERCENTILE RANK

Boys

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10–	3		2		
11	9	5	6	4	2
16	19	16	10	7	4
21	30	36	30	18	8
26	55	28	27	18	17
31	44	50	41	30	10
36	91	56	55	45	23
41	75	71	68	52	45
46	96	73	59	56	39
51	86	76	51	51	45
56	81	66	63	57	33
61	80	51	58	35	42
66	54	32	46	36	36
71	58	40	44	24	21
76	45	28	30	32	18
81	23	32	22	13	8
86	11	14	8	4	4
91	7	7	7	1	1
96	1	2	1	1	
No. of Cases	868	683	628	484	356

TABLE 51
DISTRIBUTIONS: PHYSICAL TESTS—AVERAGE PERCENTILE RANK

Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10–	2			1	1
11	7	4	3	1	1
16	15	8	7	8	3
21	18	18	24	11	5
26	31	31	25	17	10
31	53	45	35	21	12
36	57	41	35	27	15
41	51	55	47	31	20
46	73	55	64	57	25
51	79	54	53	38	46
56	71	59	60	44	20
61	56	47	50	40	21
66	51	39	50	34	30
71	45	32	30	24	17
76	24	26	18	28	10
81	15	9	17	9	6
86	11	6	4	3	3
91	2	4	1	2	
96					
No. of Cases	661	533	523	396	245

CHAPTER IV

THE SCALE OF MENTAL MEASUREMENTS

In the present chapter we shall present the results of the mental measurements for the entire group of children of each age, regardless of whether they are at work or in school. The detailed comparison, by industrial and school groups, by ages, by sexes, and by educational status, will be taken up in later chapters. Our present purpose is to present the results of the mental measurements in the same form in which we presented the physical measurements in the previous chapter—as a series of scales which can be used for measurement. We shall first discuss each mental measurement made, presenting the results in the form of a percentile scale of twenty divisions for each year in which the test was given. We shall then develop a scale of average percentile ranks for each of the five years from fourteen to eighteen years inclusive. Unlike the physical series, the mental tests given differ somewhat from year to year. Only tests whose actual content could be varied from year to year could be repeated without danger of introducing too large an element of memory and practice. Even those that could be varied became uninteresting if used too often. Tests of the ingenuity type obviously could not be repeated at all.

The only tests repeated each year for the five years were cancellation, substitution, and memory. A controlled-association test was given each year. It consisted of easy opposites at fourteen and fifteen, cause and effect at sixteen, hard opposites at seventeen, and easy opposites again at eighteen. A test of the sentence-completion type was used each year. At fourteen, fifteen, and sixteen it consisted of finishing a sentence of which the first few words were furnished. At seventeen and eighteen, it was a test of the mutilated-text type. Tests of the construction-puzzle type were used at years sixteen, seventeen, and eighteen. Tests of the puzzle-box type were used at years fifteen, sixteen, seventeen, and eighteen. The Healy and Fernald puzzle box was used at fifteen and sixteen, the Hayes instruction box at seventeen, and the Freeman puzzle box at eighteen. Tests used only once, at year eighteen, were Woodworth and Wells hard instructions, recognition of geometrical forms, an *Aussage* test and the Yerkes Point Scale. The exact measures selected for the scale of average percentile ranks will be discussed in connection with each test.

Cancellation

(1, test 26)

The form of cancellation test adopted was the standard page of small letters described in Whipple's Manual, Test 26. The page contains fifty of each of the letters of the alphabet, irregularly distributed. There are two forms, one beginning with the letters *h p* and one with *c z*. Our original intention was to use a different letter each year. We selected letters which do not extend either above or below the line as more uniform in difficulty. Our first list of five was *a*, *m*, *w*, *r*, and *s*. After giving three of them, however, we discovered that the differences in the difficulty of cancelling the letters were so great that comparisons from year to year were rendered

TABLE 52 — CANCELLATION — INDEX IN SECONDS

Boys

Percentiles	14 Yr. Letter *a*	15 Yr. Letter *m*	16 Yr. Letter *w*	17 Yr. Letter *a*	18 Yr. Letter *m*
5	375.8	249.4	281.	276.0	210.9
10	329.7	230.8	251.	258.9	194.9
15	299.3	218.4	235.	238.6	185.5
20	280.6	209.8	224.	227.1	177.0
25	267.4	201.1	215.	216.1	169.9
30	255.5	193.9	207.	206.1	162.8
35	244.8	186.7	200.	197.9	157.3
40	335.5	179.9	194.	192.6	153.0
45	227.4	174.5	189.	187.3	148.6
50	219.4	169.0	184.	182.0	144.3
55	212.7	163.6	178.	177.2	139.9
60	205.9	158.3	174.	172.7	136.0
65	199.2	153.0	169.	168.2	132.0
70	192.5	147.8	163.	163.7	128.0
75	185.7	142.6	160.	159.0	124.0
80	178.7	136.9	153.	153.2	120.1
85	170.1	130.7	147.	147.4	114.4
90	161.5	124.6	141.	141.5	108.7
95	146.8	115.1	130.	128.4	102.9
No. of Cases . .	843	676	629	472	357
Median	219.4 ± 1.8 P.E.	169.0 ± 1.4 P.E.	184.0 ± 1.3 P.E.	182.0 ± 1.7 P.E.	144.3 ± 1.5 P.E.
Q	40.9	29.3	27.5	28.6	23.0

very difficult. Accordingly we decided to use the letter *a* a second time at seventeen and the letter *m* a second time at eighteen. This gives an opportunity to make a direct comparison of the amount of improvement in a three-year period. The change in letter does not interfere with using the results of each year in the form of a percentile rank, since the letter remained constant for all of each year's measures.

In giving the test, the page to be marked was laid face down on the table in front of the child. The other of the two forms, with a few sample letters already marked, was in the hand of the experimenter, who showed it to the child and instructed him as follows: "On the other side of this page [pointing to the one turned down on the table] are some letters just printed

TABLE 53 — CANCELLATION — ACCURACY IN PERCENTS

Boys

Percentiles	14 Yr. Letter *a*	15 Yr. Letter *m*	16 Yr. Letter *w*	17 Yr. Letter *a*	18 Yr. Letter *m*
5	53.9	79.9	74.3	77.3	87.0
10	63.3	85.4	79.1	84.0	90.8
15	69.6	86.2	82.8	86.6	92.2
20	73.8	88.9	85.8	88.2	93.6
25	76.8	90.6	87.1	89.7	95.0
30	79.2	91.7	88.3	91.1	95.7
35	81.6	92.8	89.6	92.2	96.0
40	84.1	94.0	90.8	93.3	96.3
45	86.1	95.1	91.9	94.5	96.6
50	87.3	95.9	92.7	95.5	96.9
55	88.6	96.3	94.0	96.0	97.2
60	89.8	96.7	95.0	96.4	97.5
65	91.3	97.1	95.8	96.9	97.9
70	92.9	97.5	96.4	97.3	93.2
75	94.5	98.0	97.0	97.8	98.5
80	96.0	98.4	97.6	98.2	98.8
85	97.0	98.8	98.2	98.7	99.1
90	98.0	99.2	98.8	99.1	99.4
95	99.0	99.6	99.4	99.6	99.7
No. of Cases . .	849	681	634	478	358
Median	87.3 ± .4 P. E.	95.9 ± .2 P. E.	92.7 ± .2 P. E.	95.5 ± .2 P. E.	96.9 ± .1 P. E.
Q	8.9	3.7	5.0	4.0	1.8

in rows, like this. What I want you to do, is to draw a single line with your pencil through every *a* on this page, just the way it is done here, and see how fast you can do it. If you should make a mistake and draw a line through the wrong letter, don't stop to erase it, or try to correct it, because that would take too long—just go ahead. Of course I want you to mark every *a* on the page, and do it just as fast as possible. When I turn the page over, begin, and I will take your time with this watch."

The watch was started after the page was turned over, just as the child began to look for *a*'s, and was stopped as he finished the last line. The most important part about the instructions is to give them with such emphasis that the factors of speed and accuracy are equally prominent.

TABLE 54 — CANCELLATION — INDEX IN SECONDS

Girls

PERCENTILES	14 Yr. Letter *a*	15 Yr. Letter *m*	16 Yr. Letter *w*	17 Yr. Letter *a*	18 Yr. Letter *m*
5	334.4	216.7	249.0	243.7	187.1
10	301.0	196.4	228.0	214.7	171.2
15	276.1	186.0	215.0	199.7	159.9
20	259.9	177.4	205.0	193.5	154.9
25	245.7	171.0	197.0	187.3	150.0
30	235.1	164.7	190.0	181.0	145.1
35	226.5	158.9	182.0	175.6	140.1
40	218.0	154.7	176.0	170.4	135.2
45	209.6	150.4	171.0	165.1	130.3
50	201.2	146.1	166.0	159.9	125.4
55	194.5	141.9	161.0	155.6	120.4
60	188.0	137.9	156.0	151.2	116.4
65	181.5	133.9	151.0	146.9	112.5
70	174.4	130.0	147.0	142.5	108.5
75	167.1	126.0	142.0	137.5	104.6
80	159.7	122.0	136.0	131.6	100.6
85	151.8	116.5	130.0	125.6	100.0−
90	143.8	109.3	124.0	119.4	100.0−
95	130.8	102.1	115.0	108.0	100.0−
No. of Cases . .	649	532	524	399	276
Median	201.2 ± 1.9 P.E.	146.1 ± 1.2 P.E.	166.0 ± 1.5 P.E.	159.9 ± 1.5 P.E.	125.4 ± 1.9 P.E.
Q	39.3	22.5	27.5	24.9	22.7

The time of the test was recorded in seconds, and the accuracy in percentages. When no wrong letters were marked, the accuracy was very simply obtained by deducting 2 per cent for every omission. To facilitate marking, a page was prepared in which each of the fifty letters of the test was cut out. By laying this page over the one to be evaluated, omissions were easily and accurately counted. When wrong letters were marked, the accuracy was figured according to a formula which took both correct and incorrect markings into consideration. The formula, suggested by Whipple, was as follows:

$$\text{accuracy} = \frac{\text{letters correctly marked}}{50 + \text{letters wrongly marked}}$$

TABLE 55 — CANCELLATION — ACCURACY IN PERCENTS

Girls

PERCENTILES	14 Yr. Letter *a*	15 Yr. Letter *m*	16 Yr. Letter *w*	17 Yr. Letter *a*	18 Yr. Letter *m*
5	52.9	79.6	72.0	75.1	86.8
10	61.6	85.9	77.8	80.2	91.1
15	68.4	87.7	82.0	84.5	92.7
20	73.4	89.5	85.6	86.7	94.3
25	76.4	91.0	86.9	88.3	95.6
30	78.3	92.2	88.1	89.9	95.9
35	80.1	93.5	89.4	91.1	96.2
40	82.2	94.8	90.7	92.2	96.5
45	84.4	95.8	91.9	93.3	96.8
50	86.2	96.2	93.1	94.4	97.0
55	87.7	96.5	94.3	95.4	97.3
60	89.1	96.9	95.5	96.0	97.6
65	90.6	97.3	96.1	96.4	97.9
70	91.9	97.7	96.6	97.0	98.2
75	93.3	98.1	97.2	97.5	98.5
80	94.7	98.5	97.8	98.0	98.8
85	96.2	98.9	98.3	98.5	99.1
90	97.5	99.2	98.9	99.0	99.4
95	98.7	99.6	99.4	99.6	99.7
No. of Cases . .	655	534	530	406	276
Median	86.2 ± .4 P.E.	96.2 ± .2 P.E.	93.1 ± .3 P.E.	94.4 ± .3 P.E.	97.0 ± 1.1 P.E.
Q	9.0	3.6	5.2	4.6	1.5

An index, consisting of time divided by accuracy, representing an estimated time for a perfect performance, was figured in each case.

The method of estimating accuracy when incorrect letters were crossed did not seem fair for the most frequent type of error—the one in which, because of poor motor coördination, the letter next the *a*, for instance, was crossed, instead of the *a* itself. There were very few cases in which a wrong letter not contiguous to the correct one was marked. We counted correct any case in which the mark touched the correct letter, even though it went more definitely through another letter. In cases in which the mark did not touch the correct letter at all, and which was therefore counted wrong, the formula inflicts a double penalty for the error since it counts off both for the letter omitted and for the one wrongly crossed. In the very few papers in which many errors of this type occurred, the injustice is glaring.

The type of test is a good one for simple routine perception and coordination. It is better when letters uniform in height, such as capitals, or numerals, or geometrical figures of uniform size, are used than it is when the small letters of the alphabet are used. The test is not, however, a good index of mental ability. It is not highly correlated with any other type of ability.

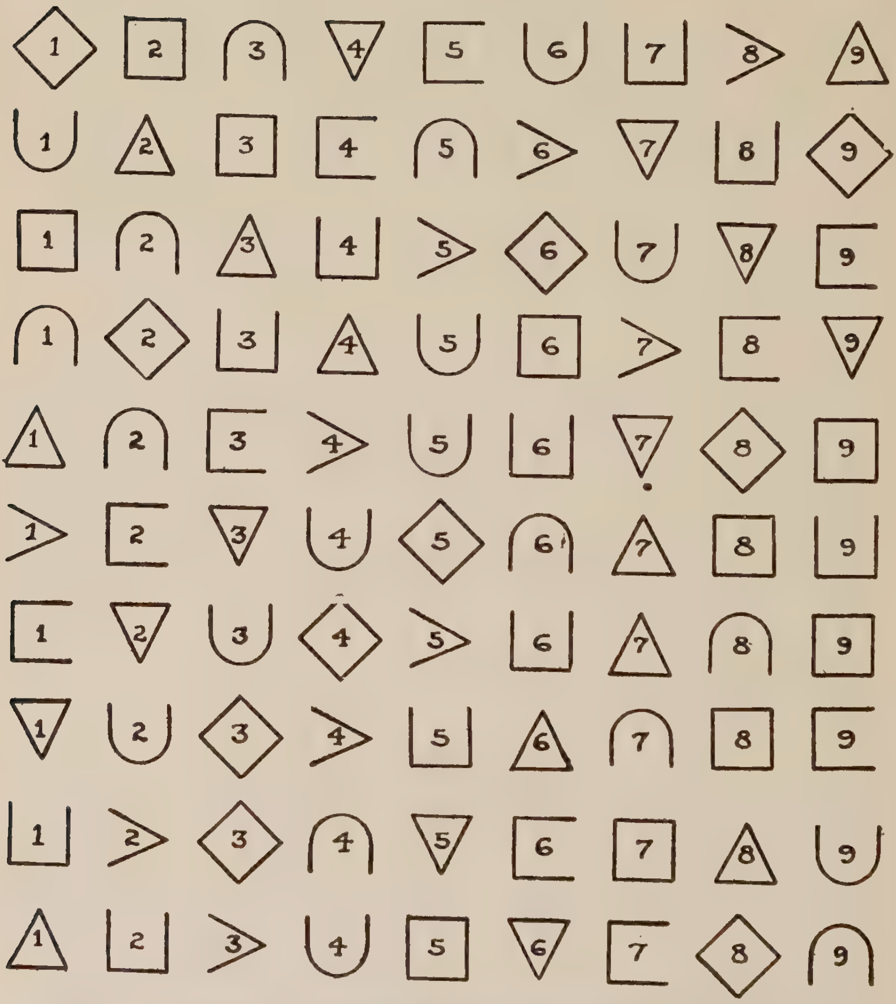
The results are presented in the form of five-percentile summaries for boys and girls separately, for each of the years from fourteen to eighteen inclusive (Tables 52, 53, 54, 55).

In the scale of average percentile rank in mental tests, cancellation constituted one measure each year. The value used was the median between the percentile rank in index and that in accuracy.

SUBSTITUTION

(1, TEST 37; 2)

The form of substitution test used was the one first described in Mental and Physical Measurements of Working Children (2, p. 148). It consisted of four pages of geometrical figures, fifty figures in each page, in ten rows of five each. Each page was so arranged that every figure appeared as nearly as possible the same number of times, and no line contained the same figure twice. Ten different keys, designated by letter, were prepared. As the keys show (see the following page), there were just nine geometrical figures, each one to be associated with a digit. Four of them consisted of pairs of figures which were easily confused in learning (in the first key, 3 and 6, and 4 and 9). The others proved to be more distinctive, though they were all very simple modifications of the square and the triangle. In repeating the test year after year, care was taken to see that a different key was used each time.



The Ten Keys Used in Giving the Substitution Test from Year to Year.

In administering the test, the experimenter laid the first page of figures before the child on the table, set the key up where it could be easily seen, supplied the child with a good pencil, and gave instructions as follows: "You see this page of figures. On this card I have the same figures, but each figure has a number in it. What I want you to do is to write in each figure on this page the number you see in the same figure on that card. For instance, what number would you put in here? [The experimenter points to one of the figures which might easily be confused with another— the figure **V** or **U**. If the child makes the wrong answer, the experimenter

TABLE 56 — SUBSTITUTION — INDEX

Boys

Percentiles	Practice Page 1					Percentiles	Practice Page 2				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.		14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs
5 . .	235.0	213.4	189.0	190.2	191.0	5 . .	190.0	175.8	159.4	157.6	162.7
10 . .	215.0	193.4	173.2	174.0	172.8	10 . .	174.0	157.6	148.8	143.0	148.7
15 . .	203.8	179.4	161.6	163.0	162.5	15 . .	162.0	147.8	139.2	135.8	138.1
20 . .	196.0	175.0	156.2	156.4	156.4	20 . .	154.2	139.5	134.0	130.2	131.9
25 . .	188.2	169.0	152.0	151.4	151.7	25 . .	148.0	136.2	129.0	124.6	125.6
30 . .	181.2	163.0	147.4	146.4	146.9	30 . .	141.2	130.0	123.8	119.6	119.6
35 . .	175.8	157.6	143.0	141.4	142.2	35 . .	137.2	125.3	119.2	116.2	116.2
40 . .	171.0	153.0	138.8	137.8	138.0	40 . .	133.6	120.5	115.0	113.0	112.8
45 . .	166.2	148.6	135.4	134.4	134.3	45 . .	130.0	116.6	111.0	110.0	109.4
50 . .	161.4	143.8	131.8	131.0	130.6	50 . .	126.4	112.8	106.8	106.4	105.9
55 . .	157.0	139.4	128.2	128.0	126.9	55 . .	122.8	109.0	102.8	103.2	102.5
60 . .	152.6	135.8	124.6	124.4	123.2	60 . .	119.2	105.2	99.0	99.8	99.1
65 . .	148.4	131.8	121.2	121.2	119.5	65 . .	115.0	101.4	95.8	96.6	95.8
70 . .	144.0	128.2	118.0	117.4	115.9	70 . .	111.0	97.4	92.6	93.0	92.4
75 . .	139.6	124.6	113.4	113.4	112.3	75 . .	107.0	93.2	89.4	89.6	89.1
80 . .	134.2	120.8	109.4	109.6	108.7	80 . .	102.8	89.2	86.4	86.0	85.8
85 . .	128.6	115.0	105.4	105.6	105.1	85 . .	98.0	85.2	83.2	82.6	82.4
90 . .	123.2	108.6	101.4	101.8	101.6	90 . .	90.4	81.2	80.4	77.8	77.2
95 . .	114.2	102.2	91.8	92.6	91.6	95 . .	83.2	71.7	69.8	69.0	66.6
No. of Cases	763	677	632	484	370	No. of Cases	772	676	634	482	370
Median	161.4 ± 1.1 P. E.	143.8 ± 1.1 P. E.	131.8 ± 1.0 P. E.	131.0 ± 1.9 P. E.	130.6 ± 1.6 P. E.	Median	126.4 ± .9 P. E.	112.8 ± 1.0 P. E.	106.8 ± 1.0 P. E.	106.4 ± 1.0 P. E.	105.9 ± 1.2 P. E.
Q . . .	24.3	22.2	19.3	19.0	24.7	Q . .	20.5	21.5	19.8	17.5	18.3

TABLE 56—*Continued*

Percentiles	Practice Page 3		Memory Page 3			Percentiles	Memory Page 4	
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.		14 yrs.	15 yrs.
5	170.8	164.2	294.6	280.8	272.5	5	271.8	254.5
10	155.4	146.0	214.9	210.0	202.2	10	212.6	206.2
15	144.4	135.6	182.4	172.9	180.6	15	180.1	163.9
20	136.6	128.4	157.9	150.0	151.1	20	156.6	146.9
25	131.2	121.0	143.5	137.2	139.3	25	143.5	131.3
30	126.0	116.6	128.0	125.8	130.5	30	133.0	118.5
35	120.0	112.8	117.1	117.6	120.8	35	123.4	113.1
40	116.8	108.8	111.4	111.1	112.6	40	116.6	107.7
45	113.4	105.0	105.6	104.9	106.1	45	111.4	102.3
50	110.0	101.0	99.9	99.0	100.3	50	106.2	97.7
55	106.8	97.6	95.6	94.3	94.3	55	100.9	93.7
60	103.2	94.2	91.4	89.7	88.7	60	97.0	89.8
65	100.0	90.9	87.2	86.5	84.8	65	93.4	85.8
70	96.0	87.6	82.9	83.3	80.9	70	89.8	81.9
75	92.0	84.2	79.2	80.1	77.0	75	86.2	77.9
80	88.0	80.8	74.2	76.0	73.1	80	82.6	73.8
85	83.8	76.0	69.8	71.6	69.2	85	76.2	69.7
90	79.6	70.7	65.4	66.8	65.1	90	71.6	65.7
95	69.8	65.3	61.0	61.7	61.0	95	65.2	61.6
No. of Cases . .	766	677	618	480	370	No. of Cases . .	760	670
Median	110.0 ± .8 P. E.	101.0 ± .9 P. E.	99.9 ± 1.6 P. E.	99.0 ± 1.6 P. E.	100.3 ± 2.0 P. E.	Median	106.2 ± 1.3 P. E.	97.7 ± 1.3 P. E.
Q	19.6	18.4	32.2	28.5	31.2	Q	28.7	26.7

points out the error.] And in here? [The experimenter points to one of the unique figures.] I want you to begin here at the top of the page and fill in the figures in rows, just as you come to them. As you finish each row, I will cover it up with this piece of cardboard, this way. Now begin, and see how fast you can get the whole page done."

The stop watch was started as soon as the child began to look on the card for his first number, and stopped as he finished writing the last one. If the child noticed errors before the line was covered, he was allowed to correct them. The object in covering each line as soon as the child filled it in was to make sure that on the practice pages he worked constantly from the key and on the final page constantly from memory—never from his own previous records.

At years fourteen and fifteen, three practice pages were allowed; and at years sixteen, seventeen, and eighteen, two. On each practice page the suggestion of speed was given. At the beginning of the third page in the fourteen- and fifteen-year series, and at the beginning of the second page in the remaining series, the experimenter said: "Fill in this page, and try to do it still faster this time. When you finish this page, I will take the card away, and then I want you to try to fill in the last page from memory."

The test proved so easy, even for the working children, in the three-page form that it was reduced to two practice pages during the last three years. This change in form makes it impossible to get a uniform comparison from year to year, except for the first practice page, where conditions

TABLE 57 — SUBSTITUTION — INDEX IN SECONDS

Boys

Sum of the Practice Pages

Percentiles	Pages 1, 2, 3		Pages 1 and 2		
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	573	525	337	340	340
10	529	483	315	314	311
15	496	456	301	296	295
20	478	436	287	282	285
25	461	420	278	271	274
30	446	407	270	264	264
35	432	393	262	256	253
40	420	379	254	249	246
45	410	369	245	243	239
50	399	361	237	238	233
55	389	352	231	232	227
60	379	339	225	226	221
65	369	331	220	220	216
70	358	321	214	214	210
75	347	311	208	207	205
80	336	300	201	201	199
85	324	286	194	193	190
90	306	272	185	185	181
95	284	257	169	176	167
No. of Cases	767	670	632	477	370
Median	399 ± 2.5 P. E.	361 ± 2.5 P. E.	237 ± 1.8 P. E.	238 ± 1.9 P. E.	233 ± 2.1 P. E.
Q	57	54.5	35.0	32.0	34.5

remained constant. Page 2 is a practice page at all ages, but is given at years fourteen and fifteen without warning of the memory page, and at the remaining years, after a warning. Page 3 is a practice page, given after a warning, at years fourteen and fifteen, but is the memory page at the remaining years. Page 4 is a memory page, given only at years fourteen and fifteen.

In dealing with the results, time in seconds and accuracy in percents were recorded for each page separately. Since there were just fifty figures on a page, each error or omission meant 2 per cent off from one hundred. The two measures of time and accuracy were then combined into an index, which was time divided by accuracy, or the estimated time of perfection.

TABLE 58 — SUBSTITUTION — ACCURACY IN PERCENTS

Boys

Percentiles	Memory Page 4		Memory Page 3		
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	60.8	62.0	58.7	69.1	67.0
10	70.1	71.6	70.3	71.4	75.1
15	76.5	79.1	77.0	78.7	79.7
20	81.3	84.6	81.5	82.9	83.4
25	85.1	87.8	85.1	86.1	87.9
30	88.2	90.7	88.8	89.5	90.3
35	91.4	93.1	91.7	92.5	93.4
40	93.4	94.8	93.3	94.0	95.6
45	95.0	96.2	94.6	95.2	97.6
50	96.2	96.9	95.8	96.2	98.6
55	96.8	97.6	96.6	96.9	99.3
60	97.5	98.1	97.2	97.5	100.0
65	98.0	100.0	97.9	100.0	100.0
70	98.4	100.0	100.0	100.0	100.0
75	100.0	100.0	100.0	100.0	100.0
80	100.0	100.0	100.0	100.0	100.0
85	100.0	100.0	100.0	100.0	100.0
90	100.0	100.0	100.0	100.0	100.0
95	100.0	100.0	100.0	100.0	100.0
No. of Cases . .	770	677	622	483	371
Median	96.2 ± .3 P. E.	96.9 ± .3 P. E.	95.8 ± .4 P. E.	96.2 ± .4 P. E.	98.6 ± .4 P. E.
Q	7.5	6.1	7.5	7.0	6.1

For the practice pages, performed with the key, the index seems a fair measure. It was doubtless true that those who made errors could have done the practice pages correctly if they had taken a little more time. But as applied to the memory page, the index is a less understandable quantity. It is not true that those who made errors on the memory page could have done it correctly if they had taken more time. Moreover, the imperfect memory in most instances modified the time of the memory page directly, since uncertainty and hesitation meant a much slower performance. In this instance, the index represents a double penalty for imperfect performance. It serves the purpose of providing a rough and

TABLE 59 — SUBSTITUTION — INDEX IN SECONDS

Girls

PERCENTILES	PRACTICE PAGE 1					PERCENTILES	PRACTICE PAGE 2				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.		14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5 . .	235.4	207.8	194.4	195.6	194.9	5 . .	183.6	164.0	171.4	169.2	170.2
10 . .	212.6	189.0	175.2	175.0	177.5	10 . .	170.6	155.2	153.4	150.0	152.0
15 . .	198.0	177.0	164.4	163.8	165.0	15 . .	159.8	144.0	142.8	138.0	139.5
20 . .	189.8	169.8	157.0	156.4	155.7	20 . .	154.4	137.6	135.6	131.6	129.9
25 . .	181.2	162.8	151.6	150.8	148.6	25 . .	148.8	131.8	129.8	125.2	120.3
30 . .	176.2	157.4	146.4	145.2	141.5	30 . .	143.2	126.6	123.8	119.4	116.3
35 . .	171.6	152.8	141.2	139.8	137.6	35 . .	138.0	121.6	118.8	116.2	112.5
40 . .	167.0	148.6	138.0	136.6	134.6	40 . .	133.6	118.0	115.4	112.8	108.7
45 . .	162.4	144.1	134.4	132.6	131.6	45 . .	129.2	115.8	112.0	109.4	104.9
50 . .	158.0	139.8	131.4	130.0	128.6	50 . .	124.8	111.6	108.4	106.0	101.1
55 . .	154.0	137.4	128.4	126.8	125.6	55 . .	120.4	108.6	105.0	102.8	98.0
60 . .	150.0	133.2	125.2	123.4	122.6	60 . .	116.6	105.6	101.6	99.4	95.2
65 . .	145.8	130.0	122.2	120.2	119.4	65 . .	112.8	102.4	98.0	96.0	92.5
70 . .	141.8	126.8	118.6	115.8	115.6	70 . .	109.0	99.0	94.6	92.6	89.7
75 . .	137.0	123.4	114.4	111.4	111.7	75 . .	105.2	95.6	91.2	89.2	86.9
80 . .	132.0	120.2	111.4	107.0	107.9	80 . .	101.4	90.2	87.6	86.0	84.1
85 . .	126.8	114.2	106.0	102.4	104.0	85 . .	96.0	85.8	84.2	82.6	81.3
90 . .	121.6	108.0	101.6	96.4	100.2	90 . .	89.4	80.2	80.8	77.8	75.6
95 . .	111.0	102.0	92.5	88.2	89.8	95 . .	83.0	72.4	70.6	69.0	67.2
No. of Cases	621	538	532	401	277	No. of Cases	624	537	534	401	278
Median	158.0 ± 1.1 P. E.	139.8 ± 1.1 P. E.	131.4 ± 1.0 P. E.	130.0 ± 1.2 P. E.	128.6 ± 1.4 P. E.	Median	124.8 ± 1.0 P. E.	111.6 ± .9 P. E.	108.4 ± 1.0 P. E.	106.0 ± 1.1 P. E.	101.1 ± 1.2 P. E.
Q . .	22.1	19.7	18.6	19.7	18.5	Q . .	21.8	18.1	19.3	18.0	16.7

TABLE 59—*Continued*

PERCENTILES	PRACTICE PAGE 3		MEMORY PAGE 3			PERCENTILES	MEMORY PAGE 4	
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.		14 yrs.	15 yrs
5	169.0	156.0	303.1	285.8	284.0	5	282.8	249.4
10	154.8	140.8	243.2	244.0	217.0	10	214.5	186.5
15	145.0	133.8	205.1	202.1	173.8	15	179.9	157.3
20	137.6	127.2	181.0	165.3	148.7	20	159.1	141.5
25	132.4	120.6	160.0	144.5	133.3	25	147.0	131.5
30	127.4	116.4	141.9	130.9	122.3	30	136.1	122.1
35	122.2	112.6	128.9	121.9	114.4	35	126.9	115.1
40	118.0	108.6	118.1	112.9	106.6	40	118.9	108.7
45	114.6	104.8	111.7	106.0	99.1	45	113.9	102.4
50	111.0	100.8	105.2	100.1	95.1	50	109.0	97.5
55	107.4	97.4	99.2	94.6	91.2	55	104.0	93.4
60	104.0	94.2	95.2	89.4	87.8	60	99.2	89.4
65	100.6	90.8	91.2	85.9	84.6	65	95.0	85.3
70	96.2	87.6	87.2	82.4	81.4	70	90.7	81.2
75	91.8	84.4	83.2	78.6	77.9	75	86.5	77.0
80	87.6	81.0	78.9	74.1	74.3	80	82.3	72.6
85	83.2	76.2	73.0	69.4	70.6	85	77.0	68.3
90	77.8	70.8	67.3	63.9	65.3	90	70.9	63.9
95	68.8	65.4	61.6	57.4	59.0	95	64.8	58.0
No. of Cases . .	621	537	524	404	276	No. of Cases . .	622	538
Median.	111.0 ± 1.0 P. E.	100.8 ± .9 P. E.	105.2 ± 2.0 P. E.	100.1 ± 2.0 P. E.	95.1 ± 2.0 P. E.	Median	109.0 ± 1.5 P. E.	97.5 ± 1.5 P. E.
Q	20.3	18.1	38.4	33.0	27.7	Q	30.3	27.3

somewhat arbitrary method of assigning a single value to the memory page, in which both time and accuracy play a part.

To obtain a common measure for the practice part of the test, the indices of the practice pages were added.

The results show that, with the amount of practice given, the majority of individuals reach a high degree of accuracy on the memory page. Seventy per cent have an accuracy of 90 or more on the memory page—a degree of accuracy which means only careless and inadvertent errors. The chief difference appears in the time required to reach this more or less uniform degree of accuracy. While some individuals have done it with high speed and no practice errors, others have done it very slowly and with practice errors. However, the accuracy of the practice pages was on the whole so high that it does not furnish a basis of differentiation between groups. The use of the index takes errors into consideration in the individual record.

In using the test as an element in the scale of average percentile ranks on mental tests, two measures were chosen. The first is the sum of the indices of the practice pages (Tables 57 and 60), and the second is the median between index and accuracy on the memory page (Tables 56, 58, 59, 61). The index alone is an unfair measure of the memory page because it penalizes errors too heavily.

The test is a good one for a routine type of efficiency, which is demanded in many kinds of work. It seemed worth two measures on the scale.

TABLE 60 — SUBSTITUTION — INDEX IN SECONDS

Girls

Sum of the Practice Pages

Percentiles	Pages 1, 2, 3		Pages 1 and 2		
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	575	534	354	348	345
10	527	472	323	314	322
15	497	443	305	295	298
20	475	423	291	280	279
25	457	410	279	270	269
30	442	396	268	261	261
35	427	386	261	253	254
40	416	376	254	246	247
45	406	365	248	241	240
50	397	354	242	235	233
55	388	346	236	230	226
60	378	338	229	224	220
65	368	331	223	218	214
70	356	322	217	211	208
75	343	311	211	204	203
80	330	299	205	197	196
85	316	287	198	189	188
90	301	273	188	180	180
95	279	254	174	167	167
No. of Cases . . .	622	530	532	398	277
Median	397 ± 2.9 P. E.	354 ± 2.8 P. E.	242 ± 1.8 P. E.	235 ± 2.1 P. E.	233 ± 2.5 P. E.
Q	57	50	34	33	33

MEMORY

(1, TEST 38A)

The memory test used was immediate memory for digits, administered by the auditory-visual-motor method. Two seven-place, two eight-place, and two nine-place series of digits, printed in large black numerals on strips of cardboard, were used in giving this test. A five-place series was used for illustration and practice. The test was timed with a metronome.

In giving the test, the strips of cardboard, with the series arranged in order of length, were laid face down on the table. The child was given pencil and paper, the metronome conveniently placed, and instructions

TABLE 61 — SUBSTITUTION — ACCURACY IN PERCENTS

Girls

PERCENTILES	MEMORY PAGE 4		MEMORY PAGE 3		
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	60.8	63.2	50.4	53.5	57.9
10	73.8	75.6	64.5	69.2	72.4
15	79.1	81.3	73.1	76.4	78.8
20	83.9	85.3	77.6	80.2	83.5
25	86.7	89.1	82.2	83.7	88.4
30	89.4	91.8	85.7	88.1	92.3
35	92.1	93.8	89.5	91.4	95.0
40	93.6	95.7	91.7	93.4	96.5
45	95.2	96.5	93.4	94.7	97.4
50	96.4	97.1	94.8	95.9	98.2
55	97.2	97.7	96.0	96.7	98.7
60	98.0	98.1	96.7	97.4	99.2
65	98.2	100.0	97.3	100.0	99.7
70	100.0	100.0	97.9	100.0	100.0
75	100.0	100.0	100.0	100.0	100.0
80	100.0	100.0	100.0	100.0	100.0
85	100.0	100.0	100.0	100.0	100.0
90	100.0	100.0	100.0	100.0	100.0
95	100.0	100.0	100.0	100.0	100.0
No. of Cases . .	626	539	525	401	278
Median	96.4 ± .3 P. E.	97.1 ± .3 P. E.	94.8 ± .5 P. E.	95.9 ± .5 P. E.	98.2 ± .8 P. E.
Q	6.7	5.5	8.9	8.2	5.8

given as follows: "On the other side of these cards are some numbers printed in a row. I am going to turn the card face up, and then I want you to read the numbers out loud with me. When we have finished reading them, I will turn the card down again, and I want you to see if you can write the numbers on your paper, just the way they were on the card—just the same numbers and in the same order. I will set this instrument ticking [does so at one a second] just to show how fast to read the numbers. Read one every time it ticks, like this [illustrates]. The first card is only a sample to see if you can understand how to do it, but write the numbers down just the same. There are five numbers on it."

TABLE 62 — MEMORY — PER CENT CORRECT

Boys

Percentiles	7-Place Series					Percentiles	8-Place Series				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.		14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5 . .	65.6	68.5	75.5	72.7	72.9	5 . .	46.6	50.2	57.0	57.6	58.9
10 . .	71.4	76.0	82.5	78.1	80.3	10 . .	53.2	58.7	65.4	66.5	66.3
15 . .	74.9	81.9	85.5	85.9	84.1	15 . .	58.1	64.2	71.1	71.4	72.6
20 . .	78.8	86.8	89.7	88.7	89.0	20 . .	61.5	68.1	75.7	75.8	76.1
25 . .	84.0	88.7	90.5	91.0	90.1	25 . .	66.1	70.9	78.8	81.8	80.3
30 . .	86.7	90.6	91.6	92.1	91.2	30 . .	68.5	72.8	81.1	84.3	84.2
35 . .	88.2	91.9	92.6	93.3	91.9	35 . .	70.9	74.7	84.7	86.7	86.1
40 . .	89.6	93.1	93.4	94.4	92.6	40 . .	72.8	77.8	86.1	89.2	87.6
45 . .	90.9	94.4	93.7	95.6	93.4	45 . .	74.8	81.5	88.2	91.2	91.3
50 . .	91.8	95.6	94.4	96.0	93.7	50 . .	78.6	84.2	91.3	92.5	92.3
55 . .	93.1	96.1	95.1	96.5	94.4	55 . .	82.0	86.8	92.3	93.8	93.3
60 . .	94.2	96.6	95.5	96.8	95.1	60 . .	84.3	89.4	93.3	95.1	93.9
65 . .	95.3	97.1	95.8	97.2	95.8	65 . .	87.1	91.5	94.0	95.9	95.1
70 . .	96.1	97.6	96.6	97.6	96.6	70 . .	90.5	93.2	95.1	96.5	95.7
75 . .	96.8	98.1	97.3	98.0	97.2	75 . .	92.4	94.8	95.8	97.1	96.4
80 . .	97.4	98.8	98.0	98.4	97.3	80 . .	94.2	96.1	97.0	97.7	97.0
85 . .	98.1	99.1	98.7	98.9	98.0	85 . .	95.8	97.1	97.6	98.3	97.7
90 . .	98.8	99.6	99.0	99.3	98.7	90 . .	97.3	98.1	98.2	98.9	98.8
95 . .	99.4	99.7	99.4	99.6	99.4	95 . .	98.7	99.1	99.5	99.5	99.5
No. of Cases	845	671	630	482	365	No. of Cases	846	669	632	482	365
Median	91.8 ± .3 P.E.	95.6 ± .2 P.E.	94.4 ± .2 P.E.	96.0 ± .2 P.E.	93.7 ± .4 P.E.	Median	78.6 ± .8 P.E.	84.2 ± .6 P.E.	91.3 ± .4 P.E.	92.5 ± .5 P.E.	92.3 ± .5 P.E.
Q . .	6.4	4.7	3.4	3.5	3.6	Q . .	13.2	12.0	8.5	7.7	8.1

TABLE 62—*Continued*

Percentiles	9-Place Series				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	40.4	43.1	46.2	46.4	46.5
10	46.0	48.0	53.4	55.0	52.6
15	50.0	52.4	57.9	60.8	58.2
20	55.1	56.9	62.0	64.6	62.6
25	57.8	59.5	65.1	68.5	67.1
30	60.2	62.1	67.6	72.1	70.6
35	52.4	64.8	69.8	75.2	74.5
40	64.5	67.3	72.6	77.9	77.1
45	66.6	69.6	75.7	80.5	79.3
50	68.9	71.8	77.6	83.8	81.5
55	71.1	74.0	80.1	86.3	83.5
60	73.1	77.0	82.9	87.9	86.5
65	75.1	81.5	84.5	89.5	87.9
70	79.2	83.9	87.6	91.2	89.8
75	82.7	86.3	89.6	93.4	92.9
80	85.7	89.1	92.6	95.6	94.2
85	89.2	91.9	93.4	96.7	95.6
90	92.7	94.8	96.2	97.9	96.7
95	96.3	97.4	97.3	99.0	98.4
No. of Cases . .	846	671	632	481	364
Median	68.9 ± .5 P. E.	71.8 ± .6 P. E.	77.6 ± .6 P. E.	83.8 ± .7 P. E.	81.5 ± .9 P. E.
Q	12.5	13.4	12.3	12.5	12.9

The sample card of five digits was then read, and any errors in procedure on the child's part corrected. The sample card may be used more than once if necessary, since its result is never taken into account. When the test has been correctly performed with the sample, the experimenter proceeds with the other cards, stating each time how many numbers there will be on each one, as "There will be seven numbers on this card," etc.

There are two precautions to be observed in the use of the metronome. The first is to time the turning of the cards with the beat of the metronome in such a way that the reading of the first number naturally and unmistakably coincides with a beat; otherwise the child and the experimenter may begin reading on different beats, and thus disturb the test. The second precaution is for the experimenter to postpone stopping the

TABLE 63 — MEMORY — SUM OF 7-, 8-, AND 9-PLACE SERIES

Boys

PERCENTILES	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	165	177	203	196	196
10	181	194	215	211	216
15	192	206	224	222	228
20	200	216	233	232	235
25	208	223	241	240	242
30	214	228	247	247	249
35	220	234	252	253	255
40	226	239	257	259	261
45	231	244	262	265	266
50	236	248	266	270	271
55	241	253	270	274	275
60	246	258	274	278	279
65	251	263	279	282	283
70	256	268	282	285	286
75	262	273	285	288	287
80	268	278	288	293	294
85	277	283	291	299	299
90	285	289	297	300	300
95	294	299	300	300	300
No. of Cases . .	844	670	628	474	363
Median	236 ± 1.2 P. E.	248 ± 1.2 P. E.	266 ± 1.1 P. E.	270 ± 1.5 P. E.	271 ± 1.5 P. E.
Q	27	25	22	24	23

metronome until the last series has been written by the child. If the metronome is stopped just after the reading and before the child has written, the sudden cessation of the sound serves as a distraction, and the condition for the writing of the last series is not uniform with those of the other series.

The evaluation of the results of this test is by no means a simple matter unless one takes into account only the perfect series. None of the rules so far devised for estimating results is satisfactory. The most serious defect, common to them all, is that they make no allowance for crediting a a correct sequence of three or more digits in the wrong part of the series. We adopted this set of rules:

1. For a correct digit in the correct place in the series, allow two, giving a value of fourteen to a perfect seven-place series, of sixteen to a perfect eight-place series, and eighteen for a perfect nine-place series.

2. For any series in which there is but *one* mistake, whether it is one omission, an addition, or a misplacement, take off two only. For instance, if the correct series is 7359624 and the child writes 7396254, count it only one error, since the series can be made perfect by changing the position of one digit—the 5.
3. In series in which there is more than one error—
   a) Allow two for every correct digit in the correct position, and one for every correct digit one place removed (except in special case under b).
   b) Allow no credit for a correct digit more than one place removed, unless it forms part of a correct sequence of three or more digits. In every such sequence, allow full credit for all except the first digit, which should be given no credit if it is more than one place removed and half credit if it is one place removed. For instance, if the correct series is 7359624 and the child writes 7962453, the series should be marked thus $\frac{2022200}{796253}$ giving a value of 8.

TABLE 64 — MEMORY — PER CENT CORRECT

Girls

Percentiles	7-Place Series					Percentiles	8-Place Series				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.		14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5 . .	64.1	72.2	77.3	73.0	70.5	5 . .	45.9	50.1	58.2	61.6	63.9
10 . .	71.2	78.1	83.4	78.5	80.8	10 . .	51.6	58.1	64.2	69.0	71.1
15 . .	75.1	84.8	86.9	85.6	85.5	15 . .	57.8	64.4	70.8	72.9	74.8
20 . .	78.5	87.3	90.1	88.7	90.1	20 . .	62.7	68.1	75.4	77.3	79.4
25 . .	84.1	89.2	91.2	91.2	90.8	25 . .	67.2	70.9	79.2	82.2	82.3
30 . .	86.9	91.0	91.9	92.8	91.9	30 . .	70.0	73.1	82.3	85.1	85.7
35 . .	88.6	92.5	93.0	94.3	93.0	35 . .	72.1	75.5	85.1	87.6	87.3
40 . .	90.2	94.1	93.1	95.7	93.7	40 . .	73.9	79.8	86.3	90.0	91.3
45 . .	91.5	95.5	93.7	96.1	94.4	45 . .	76.1	82.9	88.8	91.4	92.3
50 . .	92.6	96.1	94.4	96.4	94.5	50 . .	81.0	85.7	91.3	92.5	93.6
55 . .	93.8	96.5	95.1	96.8	95.1	55 . .	83.3	88.2	92.3	93.5	94.3
60 . .	94.9	97.0	95.8	97.1	95.8	60 . .	85.6	90.6	93.3	94.6	95.1
65 . .	95.8	97.4	96.5	97.5	96.2	65 . .	88.6	92.3	94.0	95.6	95.8
70 . .	96.6	97.9	96.6	97.9	96.6	70 . .	91.1	93.9	95.1	96.2	96.4
75 . .	97.0	98.3	97.2	98.3	97.3	75 . .	92.8	95.5	95.8	96.9	97.0
80 . .	97.7	98.8	98.0	98.6	98.0	80 . .	94.4	96.5	97.0	97.5	97.6
85 . .	98.6	99.3	98.5	99.0	98.7	85 . .	96.0	97.1	97.6	98.2	98.2
90 . .	98.9	99.7	98.7	99.4	99.0	90 . .	97.4	98.3	98.2	98.8	98.9
95 . .	99.9	99.7	99.4	99.7	99.4	95 . .	98.8	99.2	98.9	99.5	99.5
No. of Cases	654	530	535	408	278	No. of Cases	655	530	535	408	279
Median	92.6 ± .3 P. E.	96.1 ± .2 P. E.	94.4 ± .2 P. E.	96.4 ± .2 P. E.	94.5 ± .2 P. E.	Median	81.0 ± .6 P. E.	85.7 ± .7 P. E.	91.3 ± .4 P. E.	92.5 ± .4 P. E.	93.6 ± .6 P. E.
Q . .	6.5	4.6	3.0	3.6	3.3	Q . .	12.8	12.3	8.3	7.4	7.4

TABLE 64—*Continued*

Percentiles	9-Place Series				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	40.7	41.6	44.9	47.5	54.3
10	45.5	48.4	52.3	57.2	60.1
15	50.1	54.3	57.1	61.7	64.8
20	56.0	58.0	62.9	65.9	69.7
25	59.0	60.7	67.4	69.2	72.6
30	61.8	62.9	69.6	72.2	75.4
35	64.2	65.1	71.7	75.0	78.1
40	66.7	67.7	74.3	79.7	81.0
45	69.3	70.5	76.2	82.5	82.9
50	71.6	73.1	79.5	84.8	84.8
55	73.7	75.6	80.6	87.1	86.8
60	76.0	78.9	82.7	89.2	87.9
65	79.7	81.7	84.8	91.1	88.7
70	82.6	83.8	87.0	92.5	92.3
75	85.2	86.0	88.7	93.9	93.4
80	88.0	89.0	92.1	95.3	94.7
85	90.8	91.7	93.4	96.5	96.2
90	93.6	94.2	95.1	97.7	97.3
95	96.5	96.9	97.3	98.9	99.0
No. of Cases . .	653	529	535	408	279
Median	71.6 ± .6 P.E.	73.1 ± .7 P.E.	79.5 ± .6 P.E.	84.8 ± .7 P.E.	84.8 ± .8 P.E.
Q	13.1	12.7	10.7	12.4	10.4

All the values were at once reduced to percentages by reference to a table made for each series. A numerical average of the percentages for each of the pairs of series was then recorded. The results are reported first in the form of five-percentile summaries of the percents for seven-, eight-, and nine-place digits separately (Tables 62 and 64). In order to obtain a single measure for the test, these three values were added for each individual, and a scale of the sum of the averages prepared (Tables 63 and 65). In the final scale of average percentile ranks in mental tests, the value used was the sum of the averages for seven-, eight-, and nine-place series, weighted twice. The importance of immediate memory as a factor in mental efficiency and the degree of correlation of the test with other values seemed to warrant giving it a weight of two measures in the average.

TABLE 65 — MEMORY — SUM OF 7-, 8-, AND 9-SERIES

Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	165	182	203	198	207
10	185	199	220	215	225
15	197	208	229	227	236
20	205	214	238	235	247
25	212	220	244	245	254
30	218	227	248	252	259
35	224	233	254	258	264
40	230	239	259	263	268
45	236	245	263	268	272
50	241	251	267	273	277
55	246	256	271	277	281
60	251	261	275	280	283
65	256	265	279	283	285
70	261	270	282	286	287
75	266	275	285	289	290
80	272	281	288	293	294
85	279	285	291	298	299
90	285	289	298	300	300
95	294	300	300	300	300
No. of Cases . .	652	529	528	403	279
Median	241 ± 1.3 P. E.	251 ± 1.5 P. E.	267 ± 1.3 P. E.	273 ± 1.4 P. E.	277 ± 1.4 P. E.
Q	27	28	21	22	18

COMPLETION OF SENTENCES

(1, TEST 46C)

The test consists in requiring the child to write the end of a sentence of which the first few words appear printed on the blank furnished him. On our blanks were the beginnings of thirteen sentences. The number was the result of the fact that the first supply of blanks ordered for this test consisted of two pages, one containing thirteen, and one twelve sentences. To require twenty-five sentences seemed unnecessarily long and fatiguing, and so we used only the first page, containing thirteen sentences. In making new forms, to avoid possible communication and provide for a change of form from year to year, the number thirteen had to be maintained. The five forms used are shown on the following page.

	a	b	c
13.	If some one happens	Because	If some child
12.	The star	The story	The theatre
11.	Because	Since	The reason why
10.	If you do not	If you tell	Since
9.	Smile	Run	I told
8.	I hasten	I knew	Think
7.	It was evening	In the morning	It was snowing
6.	A stroke of lightning	An accident	The death of
5.	When you have to	When you see	When you went
4.	The house	The child	The factory
3.	It rains	It seems	It is better
2.	One must have patience	It is never right	One must never
1.	I entered	I heard	The boy went

	d	e
13.	In the evening	It is hard
12.	The newspaper	A strange
11.	I was sorry	Try
10.	Letter writing	He asked me
9.	The funeral of	The child learned
8.	A flash of lightning	I do not like
7.	If	The store
6.	Our dog	This summer
5.	The continuation school	A very good
4.	It is fun	Before
3.	Remember	In the rain
2.	You ought not	Boys often
1.	A year ago	When I

The five forms are not really standardized. In devising the new forms, we tried to make them of equal difficulty and of equal stimulating power.

In administering the test, the printed sheet, covered by a piece of cardboard, was placed on the table in front of the child. The experimenter was supplied with a piece of paper numbered from one to thirteen, for recording association time, and with a stop watch, both screened from the child. The usual method of screening was by holding one-half of the child's folder upright. All suggestion of speed or of timing was carefully avoided in giving this test. The instructions were worded as follows:

"On this piece of paper under the cardboard are the beginnings of some sentences. Only the first few words of the sentence are printed on the paper. What I want you to do is to write something after these words which will complete the sentence. You know what a whole sentence is, don't you? You studied about that in grammar. You may write anything you wish which makes sense, but be sure that what you write forms a whole sentence, not just part of one. For instance, if you saw the words 'The horse' on the paper, what would you write after that to make a whole sentence of it? [The answer was either approved or criticized.] I will show you these beginnings of sentences one at a time, and you write anything you wish. Here is the first one."

At this point, the experimenter with one hand pulled up the cardboard, exposing the first sentence, and with the other started the stop watch. The experimenter kept his eye on the watch, and noted the number of seconds which elapsed between the exposure of the words and the beginning of the writing, giving a rough measure of the association time for each sentence. No attempt was made to distinguish intervals of less than two seconds. Since the timing and exposing process was rather difficult, each experimenter practiced counting seconds as accurately as possible until he attained some proficiency. In giving the test, he counted seconds from the time the sentence was exposed until he could get his eye on the watch. The longer intervals, therefore, any longer than three or four seconds, were measured by the watch while the shorter ones were often merely counted. No child was allowed more than sixty seconds to start any sentence. At the end of that time, he was told to omit that sentence, and go on to the next one. The time for the entire test was recorded as well as the association time for each sentence.

Possible methods of summing up results in this test are numerous. At the start, we took eight different measures (see Mental and Physical Tests of Working Children, p. 187). They were, 1) the number of sentences attempted; 2) the number of correct sentences; 3) the number of simple and complex sentences; 4) the average number of words used in completing the sentences; 5) the number of ideas expressed; 6) the total time of the test; 7) the association time for each sentence; and 8) the index of ideas.

Only four of these measures were ever summed up: the index of ideas, the association time, the number correct, and the number of ideas expressed (Tables 66 to 73). The number of sentences attempted was in most instances the total number. Omissions were too few to form the basis of a significant summary. The number of simple and complex sentences proved to be too much influenced by the particular form used. Some of the forms had a greater tendency to call out complex sentences than others. The average number of words used proved to be a less significant factor than the number of ideas expressed, and it seemed unnecessary to use both. The total time of the test was much influenced by the child's attitude toward speed, which differed very much from child to child in spite of our attempt to avoid suggestions of speed. The total time is one factor in estimating the index. The four measures summed up are therefore the number of correct sentences, the number of ideas expressed, the index of ideas, and the association time.

The rules for evaluating these four measures were as follows:

Correctness. In marking correctness, only the form of the sentence was taken into account. A wrong tense, the wrong form of adjective or adverb, or slang and colloquial phrases did not class the sentence as wrong. Only an error which rendered the result not really a sentence at all classed it as wrong.

Number of ideas expressed. In counting the number of ideas, the intention was to find out how many distinct ideas, exclusive of repetitions, were expressed on the page. Every noun, every verb other than forms of *to be*, all auxiliaries of mood, every adjective, adverb, or personal pronoun was counted a distinct idea. Personal pronouns when used in the singular and plural were counted both times, though differences of case were not counted. Mere conjunctions, auxiliary verbs of time, prepositions, or relative pronouns referring to words on the page, or modified forms of words already used were not counted. It was found very difficult to secure uniformity in marking on this point. After trying it for some time and still finding differences of judgment which it seemed impossible to guard against, we decided to secure uniformity in our own results by leaving all the marking of this test to one person, Mrs. Fischer.

When the laboratory at Bedford began to use the test for the purpose of comparing their group of delinquent women with our working girls, Dr. Mabel Fernald formulated a set of rules for evaluating this test which were submitted to Mrs. Fischer and made to conform to her practice. These rules were used by the workers at Bedford, and are added here for the benefit of any one who may wish to use the test.

Ideas in Sentence—Completion Test

GENERAL RULES. These apply to all particular instances cited below.

1. Repetition of any words previously given or written never counted.
   a) This holds even though there be a change of the part of speech, unless there is also a complete change of meaning; *e.g.*, *cut* used both as verb and as noun would be counted only once, whereas *can* would be counted both times if used once as a noun and once as a model auxiliary.

2. Modified forms of words already used are not counted; *e.g.*, *eating* after *eat*, *go* after *went*, etc., *disobey* after *disobedient*.

3. Words which were classed as nonsensical, that is, words which had no evident connection with the beginning of the sentence they were supposed to complete were not counted as ideas. Words which were sensible—which while not completing grammatically the printed beginning of the sentence, indicated a distinct idea in the child's mind—were counted.

   E.g., in following sentences ideas were counted:
   Remember I have.
   Letter-writing to my mother. *Letter-writing* Dear sir.

   In following cases ideas were not counted—nonsensical:
   You ought not we ought not do ought don't right.

PARTICULAR RULES.

1. Nouns. Always counted.
   a) Plurals and singulars of same word not counted.
   Cf. Rule 2 above.
   b) In case of proper names, names of cities or towns, such as *New York*, *Bedford Hills*, etc. counted as one; but such names of persons as *John Smith*, etc. counted as two.

   Bedford Home counts as two, *Guilford School* counts as two, *Bedford Reformatory* counts as two, *Baltimore & Ohio* counts as one, *Central Park* counts as two, *Baltimore & Ohio Railroad* counts as two, *Coney Island* counts as one.

2. Verbs. Counted with the following exceptions:
    - a) Forms of the verb *to be* are not counted.
    - b) Auxiliary verbs are not counted except *must, can,* or *could; should* meaning *ought,* and *have to* meaning *must;* the latter, *have to* is counted after *have* (indicating possession) in a previous sentence.

      The following auxiliaries, therefore, are not counted: *shall, should, will, would, may, might, have, had, do,* and *going to* meaning future action or intent. (*Get* and *become* used with past participles of verbs are not considered as auxiliaries and are counted, *e.g., get nailed, become involved*).

3. Adjectives. Counted.
    - a) But positive, comparative, and superlative forms are not each counted. Cf. General Rule 2 above.

4. Adverbs. Counted for the most part.
    - a) The following specific adverbs are not counted: *as, about* (*about* the best), *ever, like, never, no, not, only, yet.*
    - b) The following specific adverbs, in addition to many others, are counted: *again, alone, already, just, also, certainly, here, indeed, now, quite, rather, so, sometimes, such, then, there, too, very.*
    - c) Adverbs derived from prepositions, but attached to the verb with no object expressed are not counted; *e.g., above, after, behind, about, around, before.*
    - d) The following adverbs of place closely associated with the verb are not counted: *along, away, back, backward, down, forward, out, up* (as in *step back, go away, come along*).

      Adverbs are not counted even when associated with forms of the verb *to be* which themselves receive no credit, *e.g.,* in the expressions *he is out, he is back, they are together.*

      (*Over* in the sense of "past" is counted, as in "it was *over.*" *Abroad* is counted, as in "he went *abroad.*")
    - e) Conjunctive adverbs, such as *how, now, since, so, thence, whence, whenever, where, why, whither, when,* are not counted. For example, *where* is not counted in the sentence "You ought not to go *where* you are not wanted" and in the sentence "I saw the place *where* she had stayed." *When* is not counted in the following "Remember *when* you were a little girl" and "you were not at home *when* I called."
    - f) Interrogative adverbs, such as *why, where, when, how* are counted as in the following sentences:

      Tell me *where* you went.
      If this is true, *why* did you go?
      I was sorry, but *how* could I help it?

5. Pronouns. Counted for the most part.
    - a) Personal.
        1. Both singular and plural of the same pronoun are counted; *e.g., I* and *we* —both counted.
        2. Different cases of the same pronoun not counted; *e.g., my* after *I, we* after *our*—not counted.

           (Note that *I* is counted after *our,* and *we* after *my,* etc. in accordance with Rule 1 above).
        3. *It* is never counted.
        4. Reflexives not counted after the simple form, as *myself* after *me* or *I.* Also not counted when they refer to other words in the same sentence; *e.g.,* "Our dog hurt *himself.*" Accordingly they are seldom counted.

5. Personal pronouns referring to nouns previously used in the same sentence not counted; *e.g.*, "The boy learned *his* lesson" or "The boy went on the errand *his* mother sent *him*."

b) Descriptive *this*, *that*, *these*, and *those*, in pure pronominal counted.

(Note *this* and *that* when both occur are each counted: singular and plural of either word both counted; *i.e.*, both *this* and *those*, also both *that* and *those*.

(Note that interrogative adverbs are counted whereas interrogative pronouns are not.)

c) Interrogative not counted.

1) *Who*, *which*, *what* used interrogatively are not counted, whether used in direct or indirect questions; *e.g.*, in "If some child hurt himself, *who* could help him" or in "If you can find out *who* did it, tell me."

d) Relative not counted.

1) Not counted regardless of whether antecedent noun or pronoun is included in sentence or not; *e.g.*, not counted in either of the following sentences:

"You ought not to have done *what* you did."
"I saw the man *who* did it."
i.e., *what* does not count, though *that which* does).

e) Indefinite counted.

1) *Either*, *any*, *some*, *another*, *both*, *each*, *neither*, *none*, *one*, *other*, *such* are counted. But a negative term is not counted after its corresponding positive term and *vice versa; e.g.*, *neither* not counted after *either*, nor *none* after *one*.

2) Corresponding pronominal phrases, such as *any one*, *every one*, *no one*, *some one* are each counted as one, except that negative and positive not both counted; *i.e.*, *no one* NOT counted in addition to any of the other three mentioned above. But *any one*, *every one*, and *some one* may each be counted if all three appear.

f) Adjective pronouns counted.
This, *that*, *these*, *those*, *which*, *what*, *any*, *either*, *some*, *another*, *both—each*, *neither*, *other*, *such*, etc., in adjectival use are counted, subject to the same additional rules stated for them in pure pronominal use. (See (2) a, note; (3) a; and (5) above.)

6. Articles never counted.

7. Prepositions never counted.

8. Conjunctions, as well as conjunctive adverbs, are not counted.
This includes *and*, *but*, *unless*, *because*, *although*, *until*, *also*, *as*, *either*, *if*, *neither*, *or*, *nor*, *than*, *though*, *when*, *whenever*, *while*.

9. Numerals counted.

SUPPLEMENTARY NOTES.

1. *Thing*, *something*, *nothing*, or *one*, when referring to an antecedent expressed, are not counted; *e.g.*, "The dog was a brave *one*"; "The flower is a pretty *thing*";
"The newspaper is *something* that I hate."
Otherwise they are counted.

2. Titles are counted; *e.g.*, *Mr.*, *Mrs.*, *Miss*, *Mayor*, etc.

3. a) Words properly single or compound count as one even if written as two by subjects; *e.g.; baseball*, *bulldog*, *farewell*, *good-bye*, *house-warming*, *housework*, *joy-riding*, *roller-skating*, *snowstorm*, *summer-time*, *wild-cat*, etc.

b) Two or more words constituting a single idiomatic expression equivalent to one word are counted as one; *e.g.*, *all right*, *hide and seek*, *took place*, *five and ten cent* in "*five and ten cent* store."

c) Specific combinations counted as two each: *picture show*, *sleigh ride*, *moving pictures*, *flower picking*, *trolley ride*, *card party*.

4. Single words that are parts of longer or compound words previously given are counted in addition to these; *e.g.*, *reform* after *reformatory*, *paper* after *newspaper*, *news* after *newspaper*, unless it is clearly used as synonymous. For example, *paper* is counted in the following:

   "The newspaper is printed on cheap *paper*," but is not counted in
   "The newspaper boy brought the *paper* this evening" or in
   "The newspaper is a *paper* of interesting things to read."

5. Negative expressions such as *no one*, *nobody*, *nothing*, are each counted once unless the corresponding positive expression, *e.g.*, *one*, *any one*, *some one*, *somebody*, *anybody*, *anything*, *something*, has previously been used, in which case they are not counted.

The necessity for so complicated a set of rules for marking is in itself a criticism of the test and makes it inadvisable for general use.

INDEX OF IDEAS

The index of ideas is found by dividing the total time of the test by the number of ideas expressed, thus giving an average number of seconds per idea expressed. This value proved to be a more significant measure than either time alone or number of ideas alone, since both of those measures are influenced by the child's attitude toward speed. If he thought he was expected to do the test as rapidly as possible, as he was in so many other instances, he selected short sentences, expressed few ideas, and took a short time. If he was not considering speed an essential, he was apt to select longer sentences, express more ideas, and take more time. The index which is an average time per idea expressed, equalizes these differences.

ASSOCIATION TIME

The association times were first recorded in terms of the number of sentences started in two seconds or less, the number started in from three to five seconds inclusive, the number started in from six to ten seconds inclusive, the number started in from eleven to twenty seconds inclusive, and the number started in from twenty-one to sixty seconds. There were comparatively few of the very long times. The number begun in two seconds or less furnished the best basis of comparison and is the measure of association time used.

The test was given at years fourteen, fifteen, and sixteen. By that time, both the children and the experimenters were tired of it, and a change seemed desirable. The mutilated-text test took its place at years seventeen and eighteen.

In the scale of average percentile ranks in mental tests, the sentence test is represented by the two measures which proved to be the most satisfactory, the index of ideas (Tables 66 and 70), and the association time (Tables 67 and 71). Both its degree of correlation with school grade and the contrast between the records of working and school children seemed to warrant giving it a weight of two.

TABLE 66 — SENTENCES — INDEX OF IDEAS

Boys

Percentiles	14 yrs.	15 yrs.	16 yrs.
5	23.2	20.9	20.7
10	18.0	16.9	16.4
15	16.0	14.8	14.6
20	14.6	13.5	13.3
25	13.8	12.4	12.0
30	13.0	11.6	11.3
35	12.3	10.7	10.6
40	11.6	10.2	9.9
45	11.0	9.7	9.4
50	10.4	9.2	9.0
55	10.0	8.7	8.5
60	9.6	8.3	8.2
65	9.1	8.0	7.8
70	8.7	7.6	7.4
75	8.2	7.3	7.0
80	7.8	6.9	6.6
85	7.3	6.5	6.2
90	6.9	6.2	5.7
95	6.0	5.8	5.2
No. of Cases	825	650	625
Median	10.4 ± .1 P. E.	9.2 ± .1 P. E.	9.0 ± .1 P. E.
Q	2.8	2.6	2.5

TABLE 67 — SENTENCES — NUMBER BEGUN IN TWO SECONDS OR LESS

Boys

Percentiles	14 yrs.	15 yrs.	16 yrs.
5	.0	.0	0.0
10	.6	.6	1.0
15	1.3	1.4	2.0
20	1.8	2.3	2.6
25	2.3	3.1	3.4
30	2.8	4.0	3.9
35	3.4	4.9	4.6
40	4.0	5.6	5.2
45	4.6	6.2	5.8
50	5.3	6.9	6.4
55	5.9	7.5	7.2
60	6.4	8.1	7.8
65	7.0	8.6	8.6
70	7.7	9.2	9.6
75	8.3	9.7	10.2
80	9.0	10.3	11.2
85	9.8	10.9	11.8
90	10.7	11.6	12.6
95	11.8	12.3	13.2
No. of Cases	837	658	621
Median	5.3 ± .1 P. E.	6.9 ± .2 P. E.	6.4 ± .2 P. E.
Q	3.0	3.3	3.4

TABLE 68 — SENTENCES — NUMBER CORRECT

Boys

Percentiles	14 yrs.	15 yrs.	16 yrs.
5	8.5	9.6	9.9
10	9.4	10.7	11.0
15	10.1	11.3	11.6
20	10.6	11.8	12.1
25	11.1	12.2	12.4
30	11.5	12.4	12.6
35	11.9	12.6	12.9
40	12.2	12.9	13.0
45	12.4	13.0	13.1
50	12.6	13.1	13.2
55	12.9	13.2	13.3
60	13.0	13.3	13.4
65	13.1	13.4	13.4
70	13.3	13.5	13.5
75	13.4	13.6	13.6
80	13.5	13.7	13.7
85	13.6	13.7	13.8
90	13.8	13.8	13.8
95	13.9	13.9	13.9
No. of Cases	847	657	627
Median	12.6 ± .05 P. E.	13.1 ± .03 P. E.	13.2 ± .03 P. E.
Q	1.2	.7	.6

TABLE 69 — SENTENCES — NUMBER OF IDEAS

Boys

Percentiles	14 yrs.	15 yrs.	16 yrs.
5	12.1	13.4	13.5
10	13.3	15.0	15.2
15	14.4	16.5	16.4
20	15.4	17.7	17.5
25	16.3	18.7	18.5
30	17.2	19.8	19.6
35	18.2	20.9	20.8
40	19.2	21.7	21.7
45	20.2	22.5	23.0
50	21.3	23.3	24.0
55	22.4	24.1	24.9
60	23.4	24.9	25.9
65	24.4	26.1	26.8
70	25.4	27.2	27.7
75	26.8	28.4	29.1
80	28.7	30.0	30.5
85	30.3	31.8	32.2
90	32.4	34.0	34.3
95	36.4	36.8	38.4
No. of Cases	848	656	627
Median	21.3 ± .4 P. E.	23.3 ± .2 P. E.	24.0 ± .3 P. E.
Q	5.3	4.9	5.3

TABLE 70 — SENTENCES – INDEX OF IDEAS

Girls

PERCENTILES	14 yrs.	15 yrs.	16 yrs.
5	21.3	21.1	19.6
10	17.9	17.4	16.1
15	16.3	15.3	13.9
20	14.8	13.5	12.4
25	13.8	12.2	11.5
30	12.8	11.3	10.4
35	12.1	10.5	10.0
40	11.5	10.0	9.3
45	10.9	9.5	8.8
50	10.4	9.0	8.3
55	9.9	8.5	7.9
60	9.4	8.2	7.6
65	8.9	7.8	7.2
70	8.5	7.4	6.8
75	8.0	7.0	6.5
80	7.6	6.7	6.1
85	7.2	6.3	5.7
90	6.7	6.1	5.3
95	5.9	5.8	4.8
No. of Cases	639	509	513
Median	10.4 ± .15 P. E.	9.0 ± .15 P. E.	8.3 ± .1 P. E.
Q	2.9	2.6	2.5

TABLE 71 — SENTENCES — NUMBER BEGUN IN TWO SECONDS OR LESS

Girls

PERCENTILES	14 yrs.	15 yrs.	16 yrs.
5	.0	.0	.0
10	.5	.2	1.0
15	1.1	.8	2.2
20	1.7	1.4	2.8
25	2.4	2.1	3.6
30	3.1	2.7	4.1
35	3.7	3.5	5.0
40	4.2	4.5	5.6
45	4.8	5.2	6.3
50	5.4	5.8	7.0
55	6.0	6.4	7.6
60	6.6	7.0	8.4
65	7.1	7.7	9.2
70	7.7	8.4	10.0
75	8.3	9.1	10.4
80	8.9	10.0	11.0
85	9.8	10.9	11.6
90	10.7	11.6	12.4
95	11.7	12.3	13.2
No. of Cases	656	513	522
Median	5.4 ± .15 P. E.	5.8 ± .2 P. E.	7.0 ± .15 P. E.
Q	3.0	3.5	3.4

TABLE 72 — SENTENCES — NUMBER CORRECT

Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.
5	8.8	9.3	10.4
10	9.4	10.5	11.3
15	10.2	11.3	12.0
20	10.8	11.9	12.3
25	11.2	12.2	12.6
30	11.6	12.4	12.9
35	12.0	12.7	13.1
40	12.2	12.9	13.1
45	12.4	13.0	13.2
50	12.6	13.1	13.3
55	12.8	13.2	13.4
60	13.0	13.3	13.4
65	13.1	13.4	13.5
70	13.2	13.5	13.6
75	13.4	13.6	13.6
80	13.5	13.6	13.7
85	13.6	13.7	13.8
90	13.7	13.8	13.9
95	13.9	13.9	13.9
No. of Cases	656	517	524
Median	12.6 ± .05 P. E.	13.1 ± .04 P. E.	13.3 ± .03 P. E.
Q	1.1	.7	.5

TABLE 73 — SENTENCES — NUMBER OF IDEAS

Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.
5	12.7	13.8	15.0
10	13.4	15.4	16.6
15	15.8	17.0	18.6
20	16.1	17.9	19.6
25	17.7	18.8	20.6
30	18.1	19.8	21.6
35	19.7	20.7	22.6
40	19.9	21.6	23.5
45	20.7	22.4	24.4
50	21.5	23.4	25.3
55	22.5	24.2	26.4
60	23.7	25.1	27.5
65	24.0	26.2	28.5
70	24.2	27.2	29.6
75	25.3	28.2	30.7
80	26.5	29.5	32.4
85	30.1	31.3	34.1
90	32.3	33.1	36.2
95	35.4	37.2	40.0
No. of Cases	657	505	525
Median	21.5 ± .2 P. E.	23.4 ± .2 P. E.	25.3 ± .2 P. E.
Q	3.8	4.7	5.1

Mutilated Text

(1, test 48)

In years seventeen and eighteen, the sentence-completion test was replaced by a mutilated-text test of the familiar type which consists in filling in omitted words. Two passages of prose were selected of a degree of difficulty sufficient to constitute a real task for the high-school students, but not discouragingly difficult for the working group. The passages were of the same length, and preliminary trials showed them to be of approximately equal difficulty. The two passages were as follows:

Form A. No...............Time...............

We have a good deal of sympathy .... the newspaper writer........... wrote yesterday .... too many children .... run over and killed by automobiles. Yet the .... is not always that .... the automobilist, ... sometimes rests to some .... on those who do not .... their children to avoid unnecessary .... It is a plain fact, of course, that public highways are .... the use of the whole population, ... that the automobilist is .... every obligation .... keep a good idea of the rights and privileges of every one .... mind as he goes along, but the road is his .... well as other people's when rightly used.

Form B. No...............Time...............

I asked the slovenly .... pleasant servant who answered the bell .... the landlady, and was ushered in. .... I was thinking .... a good excuse for .... lateness, I was suddenly embarrassed to find myself one of a .... of laughing people.

The merriment had not been called forth .... anything amusing .... my appearance .... my vanity had feared, but by a story which a man .... the head of the table was just finishing. The only vacant .... in the room was .... him, and I made my .... towards it rather awkwardly, ... I felt that they were .... my measure.

As I .... down he greeted me with a polite bow.

In administering the test, the blank was laid face down on the table in front of the child, who was supplied with a pencil, and the experimenter said: "On the other side of this paper is a paragraph such as you might read in a newspaper or a magazine, only that some words have been left out and blank spaces put in their stead. What I want you to do is to write in each blank space one word that would make sense in that place. For instance, if you should find a sentence like this: 'The boy went ...... the store,' what word would you put in the blank space? [Waits for the answer *to* and approves it.] That is just what I want you to do on this page. Be sure to put only one word in each blank space. Take time enough to read the paragraph through carefully first, and be sure that every word you put in really does make sense. Do it as quickly as you can."

The time limit was eight minutes. If a pause of more than five minutes occurred on the first part of the page, the experimenter suggested that the child go on and finish the rest, and then return to the difficult part. Some subjects otherwise spent all the time—like Sentimental Tommy—hunting for the right word for some one difficult blank.

In evaluating the test, either one or two points credit was allowed for each of the sixteen blanks, making a possible thirty-two points for a perfect performance. The test was summed up in terms of per cent of accuracy and total time in seconds. Speed and accuracy in evaluation were secured by the use of two tables, one for transforming scores into percents (Table 74), and the other for determining whether a given response should receive one or two points credit, or no credit at all (Table 75). The latter table was made up by keeping a record of all the responses made and of the value assigned to each. New responses were made the topic of consultation and a common judgment.

TABLE 74

PERCENTS FOR EACH POSSIBLE SCORE IN THE MUTILATED-TEXT TEST

Score	Per Cent	Score	Per Cent
1	3.1	17	53.1
2	6.3	18	56.3
3	9.4	19	59.4
4	12.5	20	62.5
5	15.6	21	65.6
6	18.8	22	68.8
7	21.9	23	71.9
8	25.0	24	75.0
9	28.1	25	78.1
10	31.3	26	81.3
11	34.4	27	84.4
12	37.5	28	87.5
13	40.6	29	90.6
14	43.8	30	93.8
15	46.9	31	96.9
16	50.0	32	100.1

TABLE 75

TABLE OF CREDITS FOR MUTILATED-TEXT TEST

FORM A

	Credit 2	*Credit 1*	*Credit 0*
1.	for, with, toward, said	from	in, to, since
2.	who, that	he, whom	
3.	about, that, of (if followed by "being"), far, saying, morning, evening, how, afternoon	there, were, absolutely, although, because, when, why	
4.	being, were, are, got, getting, get	hurt, and, was, have been hurt, are being	
5.	fault, blame, responsibility	accident, lesson, carelessness, reason, cause	things, trouble, charge
6.	of		fault of, be
7.	it, but	the blame (repetition of word used before), blame, fault, and, that, accident, this, for it	he, for
8.	extent, measure	people, parents, one, men, mothers, part, carelessness, as especially, person, others, fathers, nurse or	
9.	teach, warn, watch, tell, caution, instruct, train, advise, inform, aid	keep, correct, have, leave, learn, take care of, protect	wish
10.	crossings, danger, risks, haste	accidents, trouble, carelessness, running, trips, hurry, perhaps	things, faults, fun
11.	for	in, open, to	commonly, rightly, always, not constantly
12.	and, so, but, also	only	for
13.	under	given, taking, obeying, allowed	in, of, due, told on, using, making, is to, held
14.	to		
15.	in	on his, and, on	who, to
16.	as	own as, right as, way, just as, property as	right

Only *one* point credit given in any case where more than one word is used.

TABLE 75—*Continued*

FORM B

	Credit 2	*Credit 1*	*Credit 0*
1.	but, although, yet	and, very, and very, looking, old, little, un(pleasant)	
2.	for, about		and
3.	as, while	when, just, as, then	and, but, still
4.	of, for, about		
5.	my, our, Harry's	the	
6.	crowd, group, number, lot, company	hundred, dozen, couple, bunch, class	few, kind
7.	by, through	concerning, about, as to, because of	for, from
8.	about, in	of, with, concerning	
9.	as, which		
10.	at		
11.	chair, seat, place, spot, corner, space		
12.	beside, near, next, by, behind, opposite	towards, with, given, for, given to, close to, taken by	
13.	way	journey, advance	self, steps, move
14.	as, while, for	and, then, though, but, although, surely	
15.	taking, after		eying, observing, beyond, searching, all
16.	sat	went, came	

The results are presented in the form of five-percentile scales for time in seconds (Tables 76 and 78) and for accuracy in percents (Tables 77 and 78) for boys and girls separately.

In the scale of average percentile ranks, the two measures of the mutilated-text test take the place of the two measures of the sentence test.

TABLE 76 — MUTILATED TEXT — TIME IN SECONDS

Boys

PERCENTILES	17 yrs.	18 yrs.
5	505.0	490.7
10	497.0	462.3
15	489.1	396.3
20	481.1	364.4
25	446.2	338.7
30	418.1	318.3
35	392.5	298.7
40	368.2	278.0
45	342.1	261.3
50	317.5	244.2
55	298.7	226.7
60	280.9	208.6
65	259.6	193.7
70	239.1	179.9
75	221.5	166.1
80	206.0	151.6
85	185.6	132.6
90	163.6	114.9
95	131.9	96.1
No. of Cases	483	320
Median	317.5 ± 6.4 P. E.	244.2 ± 6.0 P. E.
Q	112.4	86.3

TABLE 77 — MUTILATED TEXT — ACCURACY IN PERCENTS

Boys

PERCENTILES	17 yrs.	18 yrs.
5	18.1	17.8
10	24.8	21.0
15	31.8	36.2
20	35.6	41.7
25	42.3	44.1
30	46.0	46.7
35	49.3	49.5
40	54.4	55.1
45	57.9	57.7
50	61.2	60.0
55	67.3	63.7
60	70.7	67.1
65	73.3	70.0
70	76.9	72.5
75	82.1	75.2
80	85.0	80.8
85	90.8	83.5
90	93.4	87.9
95	96.7	95.0
No. of Cases	486	323
Median	61.2 ± 1.1 P. E.	60.0 ± 1.1 P. E.
Q	19.9	15.6

TABLE 78 — MUTILATED TEXT — TIME IN SECONDS

Girls

Percentiles	17 yrs.	18 yrs.
5	502.5	460.9
10	494.7	391.9
15	486.8	362.3
20	475.3	335.1
25	442.2	300.7
30	411.3	285.3
35	382.6	265.0
40	355.5	246.3
45	332.3	231.7
50	311.5	214.8
55	295.3	199.5
60	281.1	187.6
65	263.2	174.8
70	241.5	159.5
75	215.9	146.0
80	191.1	133.5
85	169.0	120.3
90	146.5	106.5
95	119.2	87.6
No. of Cases	409	209
Median	311.5 ± 7.0 P. E.	214.8 ± 6.7 P. E.
Q	113.2	77.4

TABLE 79 — MUTILATED TEXT — ACCURACY IN PERCENTS

Girls

Percentiles	17 yrs.	18 yrs.
5	21.5	22.8
10	31.3	32.3
15	38.9	41.1
20	45.6	44.8
25	50.0	50.1
30	55.8	55.7
35	59.3	59.4
40	65.7	63.7
45	68.7	67.0
50	71.5	69.4
55	73.6	71.9
60	76.3	74.6
65	81.2	79.5
70	83.5	82.9
75	86.0	85.9
80	89.9	91.2
85	92.3	93.7
90	94.4	96.1
95	98.5	98.1
No. of Cases	410	225
Median	71.5 ± 1.1 P. E.	69.4 ± 1.5 P. E.
Q	18.0	17.9

Association by Opposites

(1, test 34C)

The test of association by opposites was given with lists of varying difficulty. There were eight lists ranked as easy opposites, which were given at fourteen years, fifteen years, and again at eighteen years. The eight lists with the tables prepared for crediting responses are appended to this section. There were three lists of hard opposites, which were given at seventeen and eighteen years, and which are also appended to this section with the tables prepared for crediting responses.

The lists were printed on blanks uniform in size and style with those of the test described in Whipple's Manual, Test 34C.

In administering the test, the experimenter placed the blank to be used face down upon the table, supplied the child with a good lead pencil, and instructed him as follows: "Do you know what I mean when I say that one word means just the opposite of another word? For instance, what is the opposite of *hot?*"

If the correct answer was received, the experimenter continued with *up* and *straight* as additional illustrations. None of these words appears on any of the test sheets. If the experimenter did not receive the correct answer to his original question, he tried to explain the matter further. Sometimes it was necessary to tell the child that *cold* was the opposite of *hot*, and then try the other illustrations. Occasionally we had to resort to such leading questions as the following: "If you are moving in an elevator, and are not going up, in what direction are you going?" A child who needed that kind of explanation, however, never made a success of the test.

When the experimenter felt that the child understood the test as well as he was able, he continued as follows: "On the other side of this piece of paper there is a list of words printed one under another. What I want you to do is to write on the paper after each word, the word that means just the opposite of the one you see there. For instance, if you saw *hot* there, what would you write after it? Yes. Now begin at the top, and take the words in order. If you pass one, you can't go back to it, so try to get each one as you go along and do it as fast as you can."

The stop watch was started as the child looked at the first word, and stopped as he finished writing the last one. The experimenter sat with his eye on the stop watch and told the child, in case he paused more than thirty seconds on any one word, to pass on to the next.

In evaluating the accuracy of the response, a credit of two for an entirely satisfactory opposite, or of one for a partially satisfactory one, was assigned. The entire series of lists, with the credits allowed for various responses, is appended to this section. The lists were made up gradually, on the basis of responses actually made by the children. Misspelled words were not counted as incorrect, but in case of a change of form, *i.e.*, adverbs used for adjectives, etc., only one credit was given.

No use has been made of the time measurements of this test. The time was very much influenced by the rate of writing. Measuring the length of pause on an individual word with accuracy, when the whole page was in sight, was obviously impossible. Moreover, in this instance, time was closely related to accuracy. Children who were inaccurate were slow and those who were accurate, relatively faster. Accordingly, only accuracy has been used as a measure of the result.

The eight blanks of the easy lists differ so much from one another in difficulty that it was impossible to make comparisons of sex, age, or groups unless some method of correcting results for differences of difficulty could be devised. The method of paired comparisons was used for this purpose

TABLE 80—RELATIVE DIFFICULTY OF OPPOSITE LISTS ON THE BASIS OF ACCURACY

	Bad	*Good*	*Front*	*Asleep*	*Inside*	*Strong*	*Worst*	*Wise*
Bad		(11)* .953	(5) .948	(5) .921	(5) .766	(6) .703	(5) .748	(5) .521
Good	(10) 1.049		(6) .852	(7) .931	(5) .831	(5) .831	(5) .791	(7) .633
Front	(5) 1.055	(7) 1.174		(5) 1.116	(16) .950	(11) .919	(6) .791	(16) .587
Asleep	(9) 1.086	(8) 1.074	(5) .896		(5) .900	(5) .859	(5) .829	(5) .879
Inside	(7) 1.305	(5) 1.204	(18) 1.053	(5) 1.111		(5) .878	(5) .684	(5) .797
Strong	(7) 1.432	(5) 1.203	(10) 1.088	(5) 1.164	(7) 1.139		(5) .955	(7) .837
Worst	(6) 1.337	(5) 1.265	(9) 1.265	(5) 1.207	(6) 1.463	(6) 1.047		(6) .795
Wise	(5) 1.918	(5) 1.579	(9) 1.704	(6) 1.138	(5) 1.254	(5) 1.195	(7) 1.258	
Average Ratio	(91) 1.310	(91) 1.207	(128) 1.115	(80) 1.084	(99) 1.043	(89) .919	(81) .865	(93) .721
Rating on basis of bad as 1.000	1.000	.921	.851	.827	.796	.702	.669	.550
Percents to be added to bring each list up to standard of bad		8.58	17.51	20.92	25.63	42.45	51.52	81.82
Total number of cases: 358								

*The numbers in parentheses show the number of pairs on which the average ratio is based.

TABLE 81

TABLE FOR CORRECTED ACCURACY OF EASY OPPOSITES

Good 8.6		Front 17.5		Asleep 20.9		Inside 25.6	
2.5	2.7	2.5	2.9	2.5	3.0	2.5	3.1
5	5.4	5	5.9	5	6.1	5	6.3
7.5	8.2	7.5	8.8	7.5	9.1	7.5	9.4
10	10.9	10	11.8	10	12.1	10	12.6
12.5	13.6	12.5	14.7	12.5	15.1	12.5	15.7
15	16.3	15	17.6	15	18.1	15	18.8
17.5	19	17.5	20.6	17.5	21.2	17.5	22
20	21.7	20	23.5	20	24.2	20	25.1
22.5	24.4	22.5	26.4	22.5	27.2	22.5	28.3
25	27.2	25	29.4	25	30.2	25	31.4
27.5	29.9	27.5	32.3	27.5	33.3	27.5	34.5
30	32.6	30	35.3	30	36.3	30	37.7
32.5	35.3	32.5	38.2	32.5	39.3	32.5	40.8
35	38	35	41.1	35	42.3	35	44
37.5	40.7	37.5	44.1	37.5	45.3	37.5	47.1
40	43.4	40	47	40	48.4	40	50.2
42.5	46.2	42.5	49.9	42.5	51.4	42.5	53.4
45	48.9	45.	52.9	45	54.4	45	56.5
47.5	51.6	47.5	55.8	47.5	57.4	47.5	59.7
50	54.3	50	58.8	50	60.5	50	62.8
52.5	57	52.5	61.7	52.5	63.5	52.5	65.9
55	59.7	55	64.6	55	66.5	55	69.1
57.5	62.5	57.5	67.6	57.5	69.5	57.5	72.2
60	65.2	60	70.5	60	72.5	60	75.4
62.5	67.9	62.5	73.4	62.5	75.6	62.5	78.5
65	70.6	65	76.4	65	78.6	65	81.6
67.5	73.3	67.5	79.3	67.5	81.6	67.5	84.8
70	76	70	82.3	70	84.6	70	87.9
72.5	78.7	72.5	85.2	72.5	87.7	72.5	91.1
75	81.5	75	88.1	75	90.7	75	94.2
77.5	84.2	77.5	91.1	77.5	93.7	77.5	97.3
80	86.9	80	94	80	96.7	80	100.5
82.5	89.6	82.5	96.9	82.5	99.7	82.5	103.6
85	92.3	85	99.9	85	102.8	85	106.8
87.5	95	87.5	102.8	87.5	105.8	87.5	109.9
90	97.7	90	105.8	90	108.8	90	113
92.5	100.5	92.5	108.7	92.5	111.8	92.5	116.2
95	103.2	95	111.6	95	114.9	95	119.3
97.5	105.9	97.5	114.6	97.5	117.9	97.5	122.5
100	108.6	100	117.5	100	120.9	100	125.6

TABLE 81—*Continued*

Strong 42.5		Worst 51.5		Wise 81.8	
2.5	3.6	2.5	3.8	2.5	4.6
5	7.1	5	7.6	5	9.1
7.5	10.7	7.5	11.4	7.5	13.6
10	14.3	10	15.2	10	18.2
12.5	17.8	12.5	18.9	12.5	22.7
15	21.4	15	22.7	15	27.3
17.5	24.9	17.5	26.5	17.5	31.8
20	28.5	20	30.3	20	36.4
22.5	32.1	22.5	34.1	22.5	40.9
25	35.6	25	37.9	25	45.5
27.5	39.2	27.5	41.7	27.5	50
30	42.8	30	45.5	30	54.5
32.5	46.3	32.5	49.2	32.5	59.1
35	49.9	35	53	35	63.6
37.5	53.4	37.5	56.8	37.5	68.2
40	57	40	60.6	40	72.7
42.5	60.6	42.5	64.4	42.5	77.3
45	64.1	45	68.2	45	81.8
47.5	67.7	47.5	72	47.5	86.4
50	71.3	50	75.8	50	90.9
52.5	74.8	52.5	79.5	52.5	95.5
55	78.4	55	83.3	55	100
57.5	81.9	57.5	87.1	57.5	104.5
60	85.5	60	90.9	60	109.1
62.5	89.1	62.5	94.7	62.5	113.6
65	92.6	65	98.5	65	118.2
67.5	96.2	67.5	102.3	67.5	122.7
70	99.8	70	106.1	70	127.3
72.5	103.3	72.5	109.8	72.5	131.8
75	106.9	75	113.6	75	136.4
77.5	110.4	77.5	117.4	77.5	140.9
80	114	80	121.2	80	145.4
82.5	117.6	82.5	125.0	82.5	150
85	121.1	85	128.8	85	154.5
87.5	124.7	87.5	132.6	87.5	159.1
90	128.3	90	136.4	90	163.6
92.5	131.8	92.5	140.1	92.5	168.2
95	135.4	95	143.9	95	172.7
97.5	138.9	97.5	147.7	97.5	177.3
100	142.5	100	151.5	100	181.8

as follows: Each one of the eight lists was paired with every other one, and the lists given in pairs to fifteen- and sixteen-year-old children. The order of presentation of each pair of lists was arranged so that each list appeared half the time as the first list and half the time as the second of the pair. Each list was graded on accuracy, the ratio of the first accuracy to the second calculated, and the sets of ratios averaged. All of the averaged ratios for the paired comparisons were then arranged in a table (see Table 80) and the ratios for each of the lists with every other list averaged. The average ratios of the list beginning *bad* (1.310) was the largest, showing that the *bad* list was the easiest of the eight. Assuming that the series of ratios thus devised represented the relative difficulty of the lists, we then assigned the value 1.000 to the *bad* list, and figured a relative accuracy of the other lists on this basis. The result was that if the accuracy of the *bad* list were taken as 1.000, then that of the *good* list would be .921; of the *front* list, .851; of the *asleep* list, .827; of the *inside* list, .796; of the *strong* list, .702; of the *worst* list, .660; and of the *wise* list, .550. In order to make corrections easily, it was desirable to have these

TABLE 82

NUMERICAL VALUES OF HARD OPPOSITES

List I		List II		List III	
Serious	40	To succeed	92	Tender	76
Ignorant	58	Strict	62	Frequently	66
Rude	65	Tardy	64	False	(85)*
Simple	86	Sleep	(60)*	Cross	(75)
Deceitful	58	Suspicious	40	Cruel	75
Stingy	80	Rigid	53	Generous	87
Permanent	71	Clumsy	47	Haughty	43
Despondent	85	Sinful	54	Silly	91
Certain	(75)*	Pleasant	(85)	Exciting	56
Weary	54	Refined	85	Broken	75
To spend	84	Pride	21	Miser	66
To reveal	72	To remember	100	Similar	(75)
Genuine	51	Imaginary	49	To hinder	(85)
Level	62	Beautiful	95	Strength	92
Disastrous	45	Injurious	76	Innocent	75
Wild	99	Diligent	77	Busy	72
To lack	84	To sell	99	Over	87
Past	76	Sure	69	Increase	94
To permit	69	Active	79	To preserve	67
Motion	55	Vacant	80	Belief	80
Total	1369		1382		1522

*Numbers in parentheses follow words that do not appear on King's lists. These values were assigned merely on the basis of judgment of our own staff.

TABLE 83

EASY OPPOSITES — ACCURACY IN PERCENTS, CORRECTED

Boys

Percentiles	14 yrs.	15 yrs.	*18 yrs.
5	58.7	73.8	70.9
10	69.8	83.4	81.5
15	76.6	89.7	84.3
20	81.2	92.8	87.1
25	84.4	95.5	89.5
30	86.8	98.1	91.2
35	88.7	100.8	92.6
40	90.6	103.6	93.8
45	92.4	106.5	95.0
50	94.2	109.3	95.9
55	95.9	112.3	96.7
60	97.3	115.5	97.6
65	98.7	118.7	98.4
70	100.1	122.3	99.3
75	102.1	126.7	100.0
80	104.4	131.4	100.0
85	106.8	137.2	100.0
90	109.1	144.0	100.0
95	116.7	156.1	100.0
No. of Cases	675	627	327
Median	94.2 ± .4 P. E.	109.3 ± .7 P. E.	95.9 ± .3 P. E.
Q	8.9	15.6	5.3

*No list except *bad* was used.

values expressed in terms of the per cent more difficult which each of the other lists is than the *bad* list — in other words, the per cent which would have to be added to the rating of each list to bring it up to the rating of the *bad* list. For instance, the rating of the *bad* list is 1.000 and of the *good* list .921. It would therefore be necessary to add 8.58 per cent to the rating of the *good* list to bring it up to the rating of the *bad* list. The percents to be added in correcting the accuracy of each list were as follows:

Good	8.57
Front	17.51
Asleep	20.92
Inside	25.63
Strong	42.45
Worst	51.52
Wise	81.82

TABLE 84

EASY OPPOSITES — ACCURACY IN PERCENTS, CORRECTED

Girls

PERCENTILES	14 yrs.	15 yrs.	*18 yrs.
5	60.5	72.5	76.1
10	73.1	85.4	84.2
15	78.4	91.8	86.9
20	82.0	95.3	90.1
25	84.9	98.7	91.5
30	87.3	101.6	93.0
35	89.6	104.0	94.4
40	91.7	106.3	95.5
45	93.6	108.7	96.3
50	95.4	111.1	97.1
55	96.7	114.0	97.9
60	98.0	116.8	98.8
65	99.3	119.8	99.6
70	100.6	124.5	100.0
75	103.7	130.0	100.0
80	106.7	136.4	100.0
85	109.7	143.0	100.0
90	116.6	149.7	100.0
95	124.7	165.8	100.0
No. of Cases	560	511	237
Median	95.4 ± .5 P. E.	111.1 ± .9 P. E.	97.1 ± .3 P. E.
Q	9.4	16.4	4.3

*No list except *bad* was used.

To avoid the necessity of figuring corrections, a table showing the corrected accuracy for each possible value of each list was made out (see Table 81).

This method of correcting values is, however, only a rough and rather unsatisfactory method of comparing results. It would be fairly satisfactory if every child were given a list difficult enough so that his record fell below perfection. As it was, many children who were given the *bad* list had perfect records, which could not be rated higher than 100. The comparison of results of the fifteen-year test with the eighteen-year is vitiated by the fact that only the *bad* list was used as an easy one at eighteen years, while harder lists were used at fifteen. The apparent superiority of the fifteen-year-olds is therefore entirely illusive. The comparison of the fourteen-year working group with the eighteen-year working group (see Chapter VI) is valid because the *bad* or *good* lists were used almost exclusively for these two series.

The standardization of the hard-opposites test was accomplished by a different method, and on the basis of data kindly furnished to us in manuscript form by Professor Irving King, of Iowa State University. Our lists were already made up and in use when we received the data from Mr. King. If we had had the benefit of his work in time, the lists would have been formed to be of equal difficulty, according to his method of calculation. Professor King's method was, in brief, to give his lists of opposites to one hundred educated subjects—members of the faculty, graduate students, seniors, and juniors in the University—and to formulate the results in frequency tables, which are also percentage tables, for the responses to each word. The difficulty of the word can be taken to be inversely as the number of correct responses made by this group. For instance 99 of the 100 subjects gave the response *before* to the word *after*, while only 26 gave *passive* as the response to *active*. After consultation with several experts, certain responses were selected as correct and others as partly correct. A value was then assigned to each word, based on the total percentage of correct responses of the 100 subjects. Words for which

TABLE 85 — HARD OPPOSITES — ACCURACY IN PERCENTS

Boys

Percentiles	17 yrs.	*18 yrs.
5	9.5	13.5
10	17.4	23.8
15	23.0	35.5
20	28.0	43.5
25	32.0	48.8
30	35.4	54.0
35	39.8	57.0
40	42.8	60.6
45	45.0	65.1
50	49.4	70.0
55	53.3	74.5
60	57.5	76.4
65	61.2	78.7
70	64.3	81.8
75	68.4	84.1
80	72.7	86.6
85	77.5	88.8
90	83.2	91.5
95	89.4	94.7
No. of Cases	483	136
Median	49.4 ± 1.0 P. E.	70.0 ± 1.9 P. E.
Q	18.2	17.7

*Not given to those who failed in previous opposite tests.

this value is the same can be assumed to be of equal difficulty. Using Professor King's values, our hard-opposites List I adds up to 1369, List II to 1382, and List III to 1522. Lists I and II, therefore, can be assumed to be of equal difficulty, and List III easier than the other two. The lists, with the numerical values assigned to each word, are given in Table 82.

At year eighteen, the hard-opposites were not given to working children who had failed badly in previous opposites tests. We found that those who were really unable to perform the test were so embarrassed and troubled by their bad failure that it did not seem wise to put them through the ordeal. The results are presented in the form of five-percentile summaries, for boys and girls separately. The records are for corrected scores of easy opposites, at fourteen, fifteen, and eighteen (Tables 83 and 84), and for hard-opposites at seventeen and eighteen (Tables 85 and 86). In the scale of average percentile ranks, the test is given the weight of two measures by using its percentile rank twice in taking the average.

TABLE 86 — HARD OPPOSITES — ACCURACY IN PERCENTS

Girls

Percentiles	17 yrs.	*18 yrs.
5	10.2	28.0
10	17.4	35.2
15	21.8	41.6
20	26.7	50.7
25	31.5	54.5
30	37.0	58.5
35	41.3	64.4
40	45.7	67.6
45	49.1	70.0
50	53.1	73.8
55	57.9	77.6
60	62.8	80.9
65	66.9	83.2
70	70.6	85.4
75	74.8	88.4
80	79.0	90.0
85	82.9	93.0
90	86.6	96.3
95	90.2	98.9
No. of Cases	407	153
Median	53.1 ± 1.3 P. E.	73.8 ± .8 P. E.
Q	21.7	17.0

*Not given to those who failed in previous opposite tests.

EASY OPPOSITES

LIST 1

Stimulus Word	*Credit 2*	*Credit 1*
1. good	bad, evil, poor	wrong
2. outside	inside, in-doors	in
3. quick	long, slowly	slow, sluggish
4. tall	short, low	little, tiny, small, littler
5. big	little, small, tiny	short, narrow
6. loud	soft, quiet, low, faint	softly, still, silent, noiseless
7. white	black	dirty, dark
8. light	dark, heavy, darkness	dim, night
9. happy	sad, grieved, sorry, unhappy, gloomy	mad
10. false	true, real, natural, faithful	good, correct, truthful, truth, right, upright
11. like	dislike, dissimilar, unlike, different, hate	contrary, opposite
12. rich	poor	
13. sick	well, healthy	better
14. glad	sorry, sad, grieved, unhappy	mad, sorrow, angry
15. thin	thick, stout, fat	heavy
16. empty	full, fill, occupied	rented
17. war	peace	quiet
18. many	few	little, one, none, nothing
19. above	below	down, low
20. friend	enemy, foe	unfriendly, stranger

EASY OPPOSITES

LIST 2

Stimulus Word	*Credit 2*	*Credit 1*
1. bad	good, nice, fine	right, well
2. inside	out of doors, outside	out
3. slow	quick, fast, rapid, swift	quickly, rapidly, swiftly
4. short	long, tall	big, far, high
5. little	big, large, much	tall, fat
6. soft	loud, hard, harsh	coarse, rough
7. black	white	clean, light
8. dark	light, bright, sunny	white
9. sad	happy, joyful, glad, cheerful	merry, pleasant, jolly, gay
10. true	untrue, false, deceitful, unfaithful, faithless	dishonest, wrong, traitor, lie, bad
11. dislike	like	liked
12. poor	rich, wealthy, well-to-do, good	well, right
13. well	sick, ill, unwell, poorly	poor, bad
14. sorry	glad, happy, joyful	cheerful, jolly, gay
15. thick	thin, sparse	fine
16. full	empty, vacant	scant
17. peace	war	noise, disturbance, fight, riot, misery, sadness, trouble, fighting, quarrel, excitement
18. few	many, lots, most, several, a number, numerous	none, crowd, much, more, plenty
19. below	above	high, up, on top
20. enemy	friend, ally	friendly

EASY OPPOSITES

LIST 3

Stimulus Word	*Credit 2*	*Credit 1*
1. asleep	awake	wake
2. near	far	away
3. fast	slow, sluggish	long, slowly
4. kind	cross, cruel, harsh, hateful, unkind, mean	selfish, hard, rough, rude, bad, ugly, angry, sassy
5. raw	cooked, baked, manufactured, finished	cook, boiled, done, fried, prepared
6. noisy	quiet, silent, still, noiseless	peaceful, easy, softly
7. early	late, tardy	
8. nice	bad, horrid, nasty, shabby, rude	cranky, ugly, hateful, mean, untidy, unpolite, naughty, cross, rough, unkind
9. sharp	blunt, dull, mild, stumpy	stupid, round, slow, stump, sweet
10. night	morning, day	
11. cheap	dear, expensive, costly	high, good
12. wrong	right	good
13. soft	loud, hard, harsh	coarse, rough
14. stupid	bright, smart, intelligent, wise, clever, brilliant	sharp, learning, learned, quick, alert
15. young	old	older
16. patient	doctor, impatient	grumpy, fidgety, wild, cross, cranky, restless, nervous
17. cloudy	bright, fair, clear, sunny, sunshiny, cloudless	sunshine, light, nice
18. before	after, behind, afterwards	now
19. open	shut, close, closed	
20. clean	soiled, dirty	black, cloudy

EASY OPPOSITES

LIST 4

Stimulus Word	*Credit 2*	*Credit 1*
1. front	back, behind, rear	backwards
2. safe	unsafe, dangerous, lost	caught, harmed, stolen, careless, danger
3. awake	asleep, sleep, sleepy	
4. raw	cooked, baked, manufactured, finished	cook, done, fried, boiled, prepared
5. shut	open, opened	
6. easy	difficult, hard, uneasy	
7. rude	polite, mannerly, nice	pleasant, good, gentle, fine, kind, smooth
8. winter	summer	spring, fall
9. low	high	up
10. day	night	evening
11. sharp	blunt, dull, mild, stumpy	stupid, round, slow, stump, sweet
12. late	early, on time	soon
13. stupid	clever, bright, brilliant, intelligent, smart, wise	sharp, learned, learning, quick, alert
14. old	young, new	younger, newer
15. sunny	cloudy, dark, gloomy, shady	dreary, foggy, shade, rainy
16. after	before	now
17. short	long, tall	big, far, high
18. right	left, wrong	bad
19. lazy	active, busy, diligent, energetic, hard-working, industrious, lively, thrifty	alive, awake, bright, busily, doing, earnest, fast, frisky, quick, spry, studious, willing, work, worker, working, ambitious
20. alive	dead	stupid, death

EASY OPPOSITES

LIST 5

Stimulus Word	*Credit 2*	*Credit 1*
1. strong	feeble, weak, delicate	easy, light
2. best	worst, poorest	bad, least, poor, wrong, worse, rotten
3. always	never	no time, sometimes, rarely, seldom
4. front	behind, rear, back	backwards
5. wet	dry	
6. foolish	wise, sensible	bright, correct, right, sane, smart, witty, sense, clever, serious
7. pretty	homely, ugly	
8. dead	alive, live, living	life
9. honest	dishonest, crooked, false, deceitful	steal, cheat, liar, lie, thief, bad, guilty, stealing, untrue, untruthful, unhonest
10. cross	pleasant, joyful, merry, good-natured, agreeable	contented, good, happy, kind, nice, straight, smiling, peaceful, cheery, uncrossed, parallel
11. bright	dark, dim, dreary, dull, stupid, gloomy, sad, melancholy	lazy, feeble, dumb
12. safe	dangerous, unsafe, lost	caught, stolen, danger, harmed, careless
13. smooth	rough, wrinkled	harsh, crooked, hilly, humpy, uneven, rocky, bumpy, irregular, rugged
14. summer	winter	
15. high	low	little, small, short
16. easy	difficult, hard, uneasy	
17. long	short	little, small
18. polite	impolite, unmannerly, rude, impertinent, boorish	unpolite, indecent, mean, ill-mannered, impatient, unrefined, unmanly
19. lazy	active, diligent, energetic, industrious, busy, hard-working, lively, thrifty	work, studious, earnest, bright, fast, quick, busily, willing, awake, worker, ambitious, spry, alive, working, frisky
20. right	wrong, left	bad

EASY OPPOSITES

LIST 6

Stimulus Word	*Credit 2*	*Credit 1*
1. inside	outside, out-of-doors	out
2. tall	short, low	little, tiny, small, littler
3. enemy	friend, ally	friendly
4. big	little, small, tiny	short, narrow
5. good	bad, evil, poor	wrong
6. sorry	glad, happy, joyful	cheerful, jolly, gay
7. sick	well, healthy	better
8. poor	rich, wealthy, well-to-do, good	
9. similar	dissimilar, unlike, different	unsimilar, opposite, contrary
10. false	true, real, natural, faithful	upright, right, truth, good, correct, truthful
11. prompt	late, tardy	slow, delayed, behind
12. black	white	clean, light
13. soft	hard, harsh, loud	rough, coarse
14. rough	smooth, gentle	soft, quiet, good, even
15. narrow	wide, broad	big
16. evening	morning, dawn	light, day
17. stout	thin, weak, slim, slender, skinny, lean	small, light
18. peace	war	misery, quarrel, riot, fighting, sadness, disturbance, noise, fight, trouble, excitement
19. few	many, lots, most, several, a number, numerous	much, more, crowd, none, plenty

EASY OPPOSITES

LIST 7

Stimulus Word	*Credit 2*	*Credit 1*
1. worst	best, finest	highest, most, good, better, fine
2. never	always	frequently, often, some, now, sometimes
3. dry	wet, soaked, damp	moist, saturated
4. foolish	sensible, wise	bright, clever, correct, right, sane, sense, serious, smart, witty
5. weak	firm, powerful, strong	active, healthy, lively, muscular, steady, well
6. distant	close, near	next, here, friendly, present
7. slow	fast, quick, rapid, swift	quickly, rapidly, swiftly
8. kind	cross, cruel, harsh, hateful, mean, unkind	angry, bad, hard, rough, rude, sassy, selfish, ugly
9. horrid	agreeable, nice, pleasant	decent, fair, fine, good, kind
10. cheap	costly, dear, expensive	good, high
11. left	right, taken	staid, here
12. honest	crooked, deceitful, dishonest, false	bad, cheat, guilty, lie, liar, steal, stealing, thief, unhonest, untrue, untruthful
13. dull	brilliant, bright, clear, keen, sharp, smart, shining	alive, awake, energetic, intelligent, interested, piercing, quick, spry
14. pleasant	unpleasant, cross, grouchy, hateful, horrid, mean	sad, sorrowful, gloomy, peevish
15. rough	gentle, smooth	even, good, quiet, soft
16. dirty	clean, spotless, washed	clear, decent, neat, orderly, pure, tidy, white
17. quiet	boisterous, loud, noisy, talkative	disturbing, lively, moving, racket, restless, stirring
18. soft	hard, harsh, loud	coarse, rough
19. ugly	pretty, handsome, beautiful, comely	attractive, decent, good, kind, neat, nice, polite
20. patient	doctor, impatient	cranky, cross, fidgety, grumpy, nervous, restless, wild.

Easy Opposites

List 8

Stimulus Word	*Credit 2*	*Credit 1*
1. wise	foolish, stupid, unwise	dull, dumb
2. joy	sorrow, sadness, grief	dreary, worry, joyless, unhappy, sad, sorry
3. upper	lower, under, bottom	below, down, downer, downward
4. new	old	older
5. busy	lazy, indolent, idle, unemployed, slack	dull
6. generous	miserly, stingy, selfish	greedy, mean, miser, hard
7. vacant	full, occupied, filled	rented
8. tender	tough, hard, crude	coarse, rough, mean
9. regular	irregular	substitute, sub, unregular
10. stale	fresh	
11. absent	here, present, there	
12. heavy	light	easy
13. even	rough, uneven	
14. certain	uncertain	
15. love	hate, hatred	
16. few	many, lots, several, a number, numerous, most	none, plenty, crowd, more, much
17. raise	decrease, lower, let down, seat, drop	set, fall
18. silent	noisy, talkative	loud, noise
19. shallow	high, deep	full
20. orderly	disorderly, untidy	mussed-up, noisy, unorderly

HARD OPPOSITES

LIST 1

Stimulus Word	*Credit 2*	*Credit 1*	*Credit 0*
1. serious	thoughtless, giddy, frivolous, jolly, trifling, fooling	glad, nothing, joyful, slight, careless, happy, lively, better	
2. ignorant	wise, intelligent, learned, educated, accomplished	smart, knowledge, bright, sure, knows, sensible	polite
3. rude	nice, polite, courteous, gentle	good, kind, pleasant	
4. simple	complicated, elaborate, hard, difficult, fancy	extravagant, impossible, sensible, extreme	
5. deceitful	honest, sincere, true, truthful, straight, frank, upright	truth, to reveal, steadfast	
6. stingy	generous, liberal, unselfish	good-hearted, kind, plenty, freegiving, extravagant	
7. permanent	temporary	temporarily, movable	
8. despondent	cheerful, happy, glad, hopeful, optimistic, courageous, joyful	courage	
9. certain	uncertain, doubtful, in doubt	puzzled	
10. weary	fresh, rested, wakeful, lively, alert	glad, gay, jolly, healthy	
11. to spend	to earn, to save, to keep, to hoard, to deposit	give, selfish, stingy	
12. to reveal	to conceal, to hide, to secrete, to keep secret	to listen, to keep, to not tell, to keep to self	
13. genuine	false, imitation, fake, counterfeit, artificial	duplicate, fable, adulterated, substitution	
14. level	uneven, rough, hilly, steep, mountainous	crooked, slant, slope, rocky, irregular	unlevel
15. disastrous	beneficial, safe, fortunate	joyous, uneventful	
16. wild	tame, calm, domestic	mild	timid
17. to lack	to possess, to have	to gain	
18. past	present, future	to come, here now	
19. to permit	to hinder, refuse, prohibit, to forbid		
20. motion	rest, quiet	motionless, still, stationary, stopped	

Hard Opposites

List 2

Stimulus Word	*Credit 2*	*Credit 1*	*Credit 0*
1. to succeed	to fail, to lose out, precede	to lose, failure, unsuccessful, downfall	to go backwards
2. strict	lenient, easy, easy-going	careless	
3. tardy	early, on time	present, regular	
4. sleep	wakefulness	wake, awake, alert	
5. suspicious	unsuspicious, trusting, trustful	innocent, honest, trustworthy, trusty	
6. rigid	pliable, limber, loose, limp	soft	warm, smooth
7. clumsy	graceful, nice, light, agile, dainty, skillful	slender, neat, quick, lively, handy, fine, perfect, active	limber, careful
8. sinful	pure, sinless, righteous, good, right, pious, moral, religious, holy	honest, innocent	repentful
9. pleasant	unpleasant, mean, horrid, cross, sulky, grouchy, hateful, disagreeable, surly, crabby, rainy	sad, sorrowful, angry, gloomy, peevish, unsympathetic, ugly, horrible, bad, rough, terrible, dull, mad, sorrow	
10. refined	unrefined, rough, rowdy, uncouth, low, vulgar, uncultured, coarse, unmannerly, common	ignorant, rude, dirty	
11. pride	humility, shame, modesty, meekness	careless, downcast, disgrace, dishonor	
12. to remember	to forget	forgetful	
13. imaginary	real, true	to know, certain, sure	
14. beautiful	ugly, frightful, homely, hideous		
15. injurious	helpful, harmless, healthful, beneficial, healthy	safe, all right, good for you	
16. diligent	lazy, negligent, slothful, idle, shiftless	careless	stupid, disobedient, dumb
17. to sell	to buy, to give	to keep	
18. sure	uncertain, doubtful, perhaps, undecided, in doubt	doubt, mistaken, chance, no	
19. active	inactive, slow, slothful, quiet, lazy, still, dormant, retired, dead, *i.e.*, volcano, sluggish, idle	unactive, clumsy, asleep	
20. vacant	full, filled, occupied	rented, taken	

HARD OPPOSITES

LIST 3

Stimulus Word	*Credit 2*	*Credit 1*	*Credit 0*
1. tender	tough, hard, harsh	strong, rough	
2. frequently	seldom, infrequently, rarely, never	unfrequently, rare, few	
3. false	true, honest, correct, straight, right	truth	
4. cross	pleasant, joyful, merry, good natured, agreeable	contented, good, happy, peaceful, gentle, round, kind, nice, straight, parallel, uncrossed, sweet, cheery, smiling	
5. cruel	kind, gentle, just	good, friendly, careful, nice	
6. generous	stingy, greedy, miserly, mean, tight, selfish	miser	
7. haughty	humble, modest, genial, meek	nice, kind, kind-hearted	
8. silly	sensible, sane, sound, with sense, wise	good mind, sense, right, bright	
9. exciting	quiet, unexciting, dull, quieting, calming, calm	cooling, unexcited, uninteresting, cool, dead, steady	patient
10. broken	unbroken, whole, together, mended, fixed, repaired, entire, good	sprain, unbroke	
11. miser	spendthrift, philanthropist, spender	liberal, unselfish, easy going, generous	millionaire
12. similar	dissimilar, unlike, different	opposite, contrary, unsimilar	
13. to hinder	to help, to aid, to let, to leave alone, to forward		
14. strength	weakness	weak, ill	
15. innocent	guilty, to blame, sinful, experienced, wise		
16. busy	idle, lazy, indolent, slack, unemployed, unoccupied, loafing	slow, no work, dull	
17. over	under	back	
18. increase	to decrease, to diminish	cut	
19. to preserve	to destroy, to discard, to waste, to spoil, to ruin, to use	unpreserved, decay, to throw away, to leave	
20. belief	unbelief, disbelief	unbelieving	

Cause and Effect

(3)

At year sixteen a cause-and-effect test took the place of the opposites test as a form of controlled association. Unlike the opposites test, cause and effect contains an element of memory, though mere memory is of little avail. No one can remember, after a single hearing, the associations to fifteen stimulus words, unless the relation between the stimulus word and its associate is a logical one which is understood at the first presentation. The test is primarily one of understanding the relationship of cause and effect, and using the category in forming associations.

In administering the test, the child was supplied with a piece of writing paper and a pencil. The experimenter instructed him as follows: "You know what I mean, don't you, by saying that one thing is the cause of another? For instance, I might say that a storm at sea is the cause of a ship-wreck. In that case storm is the cause and ship-wreck is the result, or effect. Or I might say that a tree is the cause of the shade under it. In that case tree would be cause and shade the effect. That is clear, is it not?

"Now I am going to read you some pairs of words. The first word of each pair is the cause and the second the effect of that cause—as though I were to read '*storm—ship-wreck.*' I will pause a little after reading each pair to give you time to think it over and be sure you understand how it is that the first thing is the cause of the second. After I have finished reading all the pairs of words, I will begin again and read only the first word of each pair—the cause—and ask you to write here on your paper the second word—the effect. If you can't think of just the effect I gave but can think of some other effect which is equally good, write that down, but if you can think of the same effect that I named, be sure to write it. If you can't think of any effect at all for a cause, make a mark to show that you have omitted a word. Now ready. First I will read them, and you can just listen."

In reading the series, the experimenter kept his eye on a stop watch and allowed five seconds to elapse between pairs, exclusive of the time required for reading. After the fifteen pairs of words had been read, the experimenter said: "Now ready to write the second word as I read the first." The list of stimulus words was then read in the following order.

Cause and Effect

Series I

	First Reading			*Second Reading*
1.	hunger	faintness	1.	the government
2.	melting snows	floods	2.	debt
3.	nourishment	strength	3.	death
4.	the government	protection	4.	hunger
5.	dirt	disease	5.	work
6.	effort	achievement	6.	a wound
7.	death	sorrow	7.	melting snows
8.	exercise	fatigue	8.	cold
9.	cold	ice	9.	practice
10.	a wound	pain	10.	effort
11.	beauty	admiration	11.	nourishment
12.	debt	trouble	12.	sin
13.	practise	skill	13.	dirt
14.	sin	punishment	14.	exercise
15.	work	wages	15.	beauty

Cause and Effect

Series II

	First Reading			*Second Reading*
1.	fright	nervousness	1.	recklessness
2.	clouds	rain	2.	germs
3.	sleep	rest	3.	perseverance
4.	recklessness	accidents	4.	fright
5.	old age	weakness	5.	crime
6.	battle	bloodshed	6.	flowers
7.	perseverance	success	7.	clouds
8.	fire	heat	8.	joking
9.	joking	laughter	9.	wealth
10.	flowers	perfume	10.	battle
11.	low wages	strikes	11.	sleep
12.	germs	contagion	12.	over work
13.	wealth	luxury	13.	old age
14.	over work	weariness	14.	fire
15.	crime	imprisonment	15.	low wages

In evaluating the test, the measure taken was the percentage of correct responses. For an entirely correct association, whether it was that of the original list or not, a credit of two was allowed. For associations which had some merit, though they were not entirely correct, a credit of one was allowed. Scores were at once changed into percentages (Table 87). A list

TABLE 87

CHANGING SCORE IN CAUSE AND EFFECT TESTS INTO PERCENTS

Boys

Score	Per Cent	Score	Per Cent	Score	Per Cent
1	3.3	11	36.7	21	70.0
2	6.7	12	40.0	22	73.3
3	10.0	13	43.3	23	76.7
4	13.3	14	46.7	24	80.0
5	16.7	15	50.0	25	83.3
6	20.0	16	53.3	26	86.7
7	23.3	17	56.7	27	90.0
8	26.7	18	60.0	28	93.3
9	30.0	19	63.3	29	96.7
10	33.3	20	66.7	30	100.0

TABLE 88

CAUSE AND EFFECT — PER CENT CORRECT

Boys — 16 years

Percentiles	
5	37.7
10	49.8
15	60.4
20	67.3
25	71.4
30	75.7
35	80.1
40	81.8
45	83.9
50	87.3
55	89.5
60	92.3
65	94.1
70	95.5
75	97.0
80	99.4
85	100.0
90	100.0
95	100.0
No. of Cases	606
Median	87.3 ± .6 P. E.
Q	12.8

TABLE 89

CAUSE AND EFFECT — PER CENT CORRECT

Girls — 16 years

Percentiles	
5	41.3
10	54.1
15	59.2
20	67.6
25	73.4
30	77.5
35	81.1
40	84.1
45	87.3
50	89.0
55	91.0
60	93.3
65	94.9
70	96.5
75	100.0
80	100.0
85	100.0
90	100.0
95	100.0
No. of Cases	534
Median	89 + .7 P. E.
Q	13.3

List of Credits for Cause and Effect

Series I

	Stimulus	*Credit 2*	*Credit 1*	*Credit 0*
1.	government	PROTECTION—protecting, protects, laws, law, order, rule, justice	decree, helps, punishment, preparedness	position, achievement, pays
2.	debt	TROUBLE—paid, sorrow, unhappy, worry	embarrassment, punishment, sorry, misery, poverty, prison	death
3.	death	SORROW—trouble, burial, sadness, pain, broken-heart, sorry	worry, anxiety	debt
4.	hunger	FAINTNESS—faint, illness, exhaustion, sickness, starvation, weak, distress, appetite	death, perish, pain, dying, fatigue, suffering, grief	enough, nourishment, nourish
5.	work	WAGES—achievement, fatigue, money, pay, tired, salary, accomplishment, happiness, reward	skill, sore, strength, success, prosperity, prosperous	diligence, weak
6.	wound	PAIN—hurt, injury, painful, soreness, suffer	blood, fatal, fall, danger, death, disease, sickness, blood poison	strength
7.	melting snows	FLOODS—high water, slush, swelling rivers, avalanche, water	bad weather, flowed	cold, storm, ice
8.	cold	ICE—freezing, frozen, chilly, chills, numbness	sickness, snow, death, pain, cough, hunger, suffering, colds	exercise, fatigue, weather, winter, winds

SERIES I—*Continued*

	Stimulus	*Credit 2*	*Credit 1*	*Credit 0*
9.	practice	SKILL—achievement, learn, perfection, perfect, skillful, succeed, success, efficiency, expertness	fatigue, strength, strengthens, tired, skillness, strong, reward	exercise, patience, pain, study
10.	effort	ACHIEVEMENT—achieve, succeed, success, results, accomplishment	gain, fatigue, makes perfect, reward, skill, work, repaid, per cent	happiness, practise, try
11.	nourishment	STRENGTH—health, healthful, healthy, strengthens, development	blood, digestion, builds, growth	do good, help, food
12.	sin	PUNISHMENT—trouble, shame, unhappiness, sorrow, sorrowful, scandal, suffering, downfall, remorse, grief, sadness, repentance	death, disaster, worry, bad conscience, destruction	forgiveness, weak, hatred, wrong
13.	dirt	DISEASE—sickness, unhealthy, unhealthful	germs, untidy, work	filth
14.	exercise	FATIGUE—strength, development, health, gives muscles, limber, tired, healthy	stiffness, energy, perfect, skill, help, tiredsome	nourishment
15.	beauty	ADMIRATION—love, admire, attention, abduction, attraction, proud, affection, vain, happiness, pleasure, enjoyment, popularity, vanity	idol, godlike, popular	fair

SERIES II

Stimulus	*Credit 2*	*Credit 1*	*Credit 0*
1. recklessness	ACCIDENTS—danger, collisions, disaster, hurt, trouble, harm, injury, punishment, wreck, damage, injuries	ruin, destruction, fear, downfall, death, nervousness, robbery, ship-wreck, murder, mistakes	pain
2. germs	CONTAGION—death, disease, sickness, contagious, ill health, contamination, fever	dirt, filth, suffering, any specific disease (*e.g.*, consumption)	
3. perseverance	SUCCESS—achievement, learn, perfection, skill	tired, strength, luck, wealth, intelligence, overwork, endurance, good fortune, good results	luxury
4. fright	NERVOUSNESS—flight, faintness, paleness, palpitation, shaking, trembling, weakness, excitement, nervous	afraid, sickness, fear, accident, disaster, scared, recklessness, alarmed, madness	carelessness
5. crime	IMPRISONMENT—law-courts, disgrace, prisons, punishment, shame, sorrow, trouble, unhappiness, workhouse, arrest, penalty, heartaches, imprison	police, scandal, killed, disaster, injury, repentance	sin, death, wickedness
6. flowers	PERFUME—admiration, delight, happiness, beauty, fragrance, odor, perfumed	sweetness, sweet, wither	attention, love
7. clouds	RAIN—darkness, dreary, gloom, snow-storm, dinginess	fog, thunder, lightning, mist	flood

SERIES II—*Continued*

	Stimulus	*Credit 2*	*Credit 1*	*Credit 0*
8.	joking	LAUGHTER—laughing, merriment, fun	anger, quarrels, argument	humor, sorrow
9.	wealth	LUXURY—comfort, idleness, luxuries, laziness, pleasure	plenty, capital, happiness, speculating, industry, greatness, unhappiness, finery, no work	
10.	battle	BLOODSHED—death, defeat, injury, ruin, sorrow, wounds, suffering, victory	fear, flight, noise, pillage, disaster	pain, courage
11.	sleep	REST—forgetfulness, dreams, refreshment, health, restfulness	beauty, quiet, good	cranky, stupidity
12.	over work	WEARINESS—fatigue, sickness, stiffness, tired, run down, break-down, ill health, sick, weary, illness	nervousness, sleeplessness, accidents, strike, weakness, hardships	worry, restlessness
13.	old age	WEAKNESS—death, feebleness, slow, weariness, failing, wrinkles, weary, helplessness, childishness, gray hairs, infirmity	blind, cranky, deaf, forgetful, rheumatism, sickness, lame, tired, despair, worn out, disabled, dreariness, nervousness, weak	
14.	fire	HEAT—burns, light, flame, destruction, warmth, sparks, disaster, damage, loss, perish, ashes, blazes, ruins, panic, smoke	fireman, fear, crackling, death, cooking, insurance, terrible, fright	matches
15.	low wages	STRIKES—debt, dissatisfaction, hunger, poor, poverty, suffering, quit, despondency, low life	grouch, sin, starvation, poor work	

of associations which had received no credit was also kept to assist in uniform grading of results. The lists of words given full, partial, or no credit, and the table for changing score into per cent correct are appended.

The results are given in terms of a five-percentile summary for boys and girls separately (Tables 88 and 89). In the scale of average percentile ranks for sixteen years, rank in cause and effect was used twice to give it double weight.

CONSTRUCTION PUZZLES

The construction-puzzle tests which we used were of the type in which pieces of various sizes and shapes are fitted into a cut-out pattern. We employed a game or puzzle, furnished by the toy trade, known as the egg of Columbus. It consists of nine little stone blocks, made up of four pairs and one odd one (Figure I). A book of patterns which can be made with the nine pieces accompanies the toy. We selected six patterns, part of them from the book and part of them made up for our series (Figure II). The patterns were named from their shape as follows: egg, flower-pot, chick, ship, cradle, and seal. Each pattern was cut out of a piece of binding board three-sixteenths of an inch thick. The pieces, when placed in the frames, projected above the surface enough to be easily picked up.

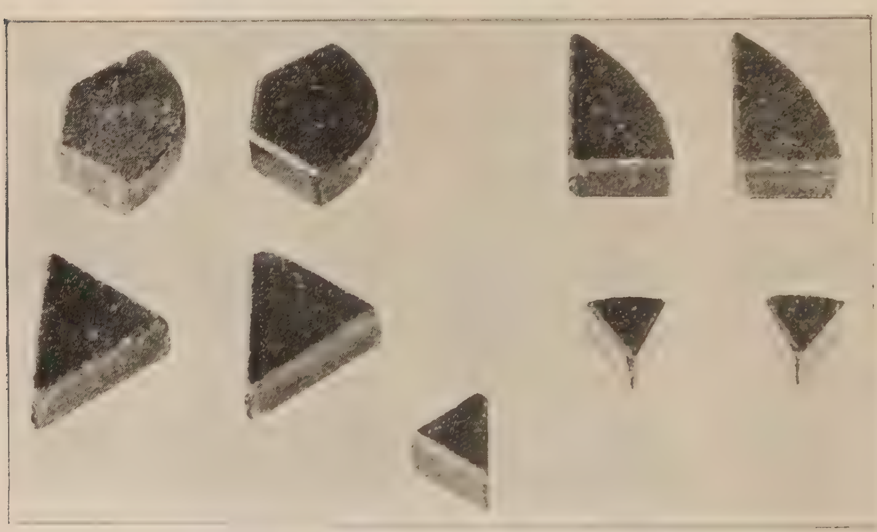


FIGURE I.—THE NINE STONE BLOCKS FOR THE CONSTRUCTION-PUZZLE TESTS.

In giving the test, one of the frames was presented to the subject and the pieces of the puzzle were laid in irregular order beside it. The subject was instructed as follows: "You see this pattern and these little

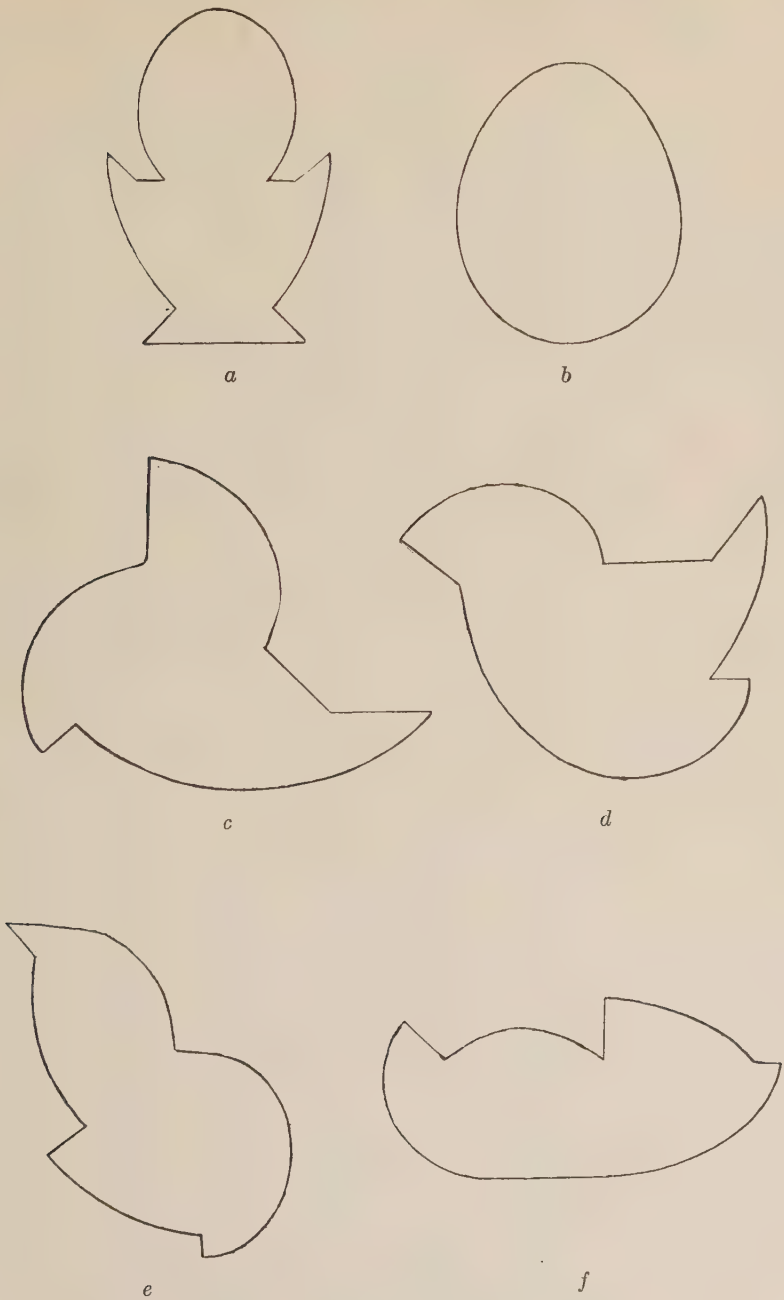


FIGURE II.—CONSTRUCTION-PUZZLE PATTERNS.

a, flower-pot; *b*, egg; *c*, ship; *d*, chick; *e*, seal; *f*, cradle.

TABLE 90 — CONSTRUCTION PUZZLES — TIME IN SECONDS

Boys

Percentiles	Egg 16 yrs.	Fl. Pot 16 yrs.	Chick 17 yrs.	Boat 17 yrs.	Cradle 18 yrs.	Seal 18 yrs.
5	300+	225.0	300+	300+	300+	300+
10	300+	157.7	300+	300+	300+	300+
15	300+	123.1	300+	300+	300+	300+
20	300+	104.1	300+	300+	300+	300+
25	300+	91.5	300+	300+	300+	300+
30	300+	82.4	292.2	300+	300+	300+
35	300+	74.2	248.2	274.1	300+	300+
40	300+	68.9	211.8	234.8	300+	300+
45	300+	63.6	182.0	200.5	300+	300+
50	300+	58.8	158.7	176.7	291.1	300+
55	300+	55.0	138.5	149.6	273.8	300+
60	300+	51.2	119.8	127.0	235.7	300+
65	300+	47.3	105.7	111.4	203.4	300+
70	270.6	43.8	92.6	98.3	175.3	263.2
75	225.0	40.6	82.1	85.5	155.4	230.7
80	188.1	37.4	72.8	73.9	132.5	199.9
85	143.8	34.4	64.9	63.0	118.9	167.4
90	103.5	31.2	55.7	52.7	102.7	141.7
95	64.5	23.8	44.1	41.8	82.9	110.2
No. of Cases	548	601	472	419	359	330

TABLE 91 — CONSTRUCTION PUZZLES — TIME IN SECONDS

Girls

Percentiles	Egg 16 yrs.	Fl. Pot 16 yrs.	Chick 17 yrs.	Boat 17 yrs.	Cradle 18 yrs.	Seal 18 yrs.
5	300+	300+	300+	300+	300+	300+
10	300+	203.6	300+	300+	300+	300+
15	300+	163.6	300+	300+	300+	300+
20	300+	138.5	300+	300+	300+	300+
25	300+	120.0	300+	300+	300+	300+
30	300+	104.3	292.0	300+	300+	300+
35	300+	92.7	253.8	300+	300+	300+
40	300+	83.6	226.1	287.4	300+	300+
45	300+	75.4	205.6	239.2	300+	300+
50	300+	69.9	176.0	202.9	300+	300+
55	300+	64.6	159.1	175.8	300+	300+
60	300+	59.4	142.3	148.9	260.9	300+
65	300+	55.4	125.8	126.6	219.0	300+
70	300+	51.6	112.6	111.4	201.9	280.4
75	267.0	46.3	100.4	96.8	178.7	245.3
80	226.6	41.4	86.4	83.5	166.4	199.4
85	180.8	36.4	71.9	71.9	136.7	162.5
90	117.3	31.5	60.4	57.7	116.0	122.6
95	66.8	23.3	49.4	47.0	90.5	94.3
No. of Cases	422	492	397	343	323	229

red stone pieces? If you put these little stone blocks into the pattern the right way, they will all go in and just make the pattern. See how quickly you can get it done." The time was taken with a stop watch.

The time limit was five minutes. Notes were made on the method of solution. Some subjects work in a haphazard fashion, and others obviously plan their solution. Some of them make foolish errors, such as trying to fit a curved edge against a straight one. Others waste an incredible amount of time trying to fit a piece into a space where it obviously will not go. These variations are significant and should play a part in an estimate of the individual, but as yet we have attempted no numerical formulation of them except in so far as they lengthen the time of solution.

The tests were given as follows: the egg and flower-pot at sixteen years, the chick and boat at seventeen years, and the cradle and seal at eighteen years. The tests are good ones of their type, but it is hard to say what their significance is. Whatever they measure, it seems unrelated to school grade, or to the contrast between working and school groups, to a greater extent than any other mental test. Moreover, the high percentage of failures in tests of the degree of difficulty represented by all except the flower-pot pattern makes a poor distribution of results to use in a scale. We discarded the egg test entirely for this reason. In taking the average percentile rank the flower-pot was used as one measure in ten at sixteen years. At seventeen years, the median between the percentile ranks of the chick and boat was used as one measure in eleven. At eighteen years, the median between the percentile ranks for cradle and seal was used as one measure in fifteen. (The five-percentile scales appear in Tables 90 and 91.)

THE HEALY AND FERNALD PUZZLE BOX

(4, p. 18)

As a test unrelated to academic subjects and involving some measure of mechanical ingenuity, the Healy and Fernald puzzle box was adopted. The box used, which was one of the first furnished to the trade, was painted black inside, rendering a solution more difficult than in the case of the later boxes which were painted white, because the hole in the bottom through which the button-hook must be passed in order to solve step one easily is scarcely visible as one looks into the black interior, but stands out very plainly from the white interior. The other defects of the box, due to the difficulty of maintaining a constant tension of the strings, are discussed in detail in the monograph on "Mental and Physical Measurements of Working Children" (*Psychological Review*, Monograph Supplement No. 77, 1914) and will not be discussed here.

In giving the test, the box was placed on the table before the child, and the experimenter instructed him as follows.

"Do you see how the cover of this box is fastened down? [Calls his attention to the fastening on the front of the box.] What I want you to do is to get the box open. You may use this button-hook [handing him the hook] any way you need to help get it open. The first thing to do is to pick the box up and study it very carefully. Look on every side of it, and turn it all about to see just how it is put together, and then try to get it open. You don't need to break anything, or undo any strings to get it open. Don't use much force. You might bend or break something if you do. When you find the right things to do, it comes open easily. Now begin and see how quickly you can do it—and be sure to study it first."

The experimenter started the watch when the child began to study the

TABLE 92

HEALY AND FERNALD PUZZLE BOX — TIME OF OPENING IN SECONDS

Boys

Percentiles	15 yrs.	16 yrs.
5	*600+	555
10	600+	362
15	600+	295
20	504	259
25	413	230
30	369	210
35	334	193
40	299	179
45	275	166
50	251	153
55	229	142
60	205	131
65	188	120
70	171	110
75	155	100
80	139	92
85	123	85
90	107	77
95	100−	63
No. of Cases	630	583
Median	251 ± 6.4 P. E.	153 ± 3.4 P. E.
Q	129	65.0

*Since, through an error, some workers used a ten-minute time limit in administering this test, it became necessary to make the table on this basis.

box and stopped it when he raised the cover. The time limit adopted was twelve minutes. Although the order of moves was recorded by number in giving the test, no statistical summary of this record of method has been made.

The box was used a second time at sixteen years with the intention of making the real test ability to set the box up again after it had been opened. The instructions were given in the same way as for the previous test, with the addition of the statements that the box was the same on which the subject had opened the year before and that in opening it again he was to notice very carefully the order in which the various moves were performed, because after opening it he would be asked to try to close it again and leave it just as he found it. In order that the test should not

TABLE 93

HEALY AND FERNALD PUZZLE BOX — TIME OF OPENING IN SECONDS

Girls

Percentiles	15 yrs.	16 yrs.
5	*600+	720+
10	600+	720+
15	600+	502
20	600+	403
25	600+	355
30	600+	306
35	600+	275
40	544	249
45	481	227
50	436	212
55	392	198
60	356	183
65	320	168
70	287	152
75	257	139
80	226	126
85	195	113
90	158	99
95	121	79
No. of Cases	506	413
Median		212 ± 6.6 P. E.
Q		108

*Since, through an error, some workers used a ten-minute time limit in administering this test, it became necessary to make the table on this basis.

consume more time than we were able to give it, the rule was made that only those who succeeded in opening the box in five minutes or less should be asked to close it.

The result of our experiment was disappointing from the point of view of deriving an element in a scale of measurement. So few succeeded in closing the box that the measure could not be used. Only 40 per cent of the boys and 22 per cent of the girls closed the box within the ten minutes allowed.

The test is a good one, aside from the difficulty of keeping the apparatus constant. It furnishes a situation requiring some real thinking about a practical problem. The results are presented in the form of five-percentile summaries of the time required for opening the box on the first trial at fifteen years and on the second trial at sixteen years (Tables 92 and 93). Only the first opening at fifteen years has been used as an element in the scale of mental measurements. The test has been given a weight of two measures out of eleven by using its percentile rank twice in taking the average percentile rank of the mental tests. Its high correlation with school grade and the marked difference between school and working groups seemed to us to warrant giving it double weight.

TABLE 94

HAYES INSTRUCTION BOX — NUMBER OF TRIALS REQUIRED IN OPENING

Boys — 17 years

Percentiles	
5	Failure
10	3
15	3
20	3
25	2
30	2
35	2
40	2
45	2
50	2
55	2
60	1
65	1
70	1
75	1
80	1
85	1
90	1
95	1
No. of Cases	464

TABLE 95

HAYES INSTRUCTION BOX — NUMBER OF TRIALS REQUIRED IN OPENING

Girls — 17 years

Percentiles	
5	Failure
10	Failure
15	Failure
20	3
25	3
30	3
35	2
40	2
45	2
50	2
55	2
60	1
65	1
70	1
75	1
80	1
85	1
90	1
95	1
No. of Cases	361

HAYES INSTRUCTION BOX

The test of mechanical ability adopted for the seventeen-year series was also devised by Professor Joseph Hayes of the University of Chicago. It is not, like the Healy and Fernald test, a mere test of mechanical ability, but involves also the element of following instructions, given by diagram, in the solution of a mechanical problem. In this instance the machinery of the box is inside, and the method of opening it cannot be studied out by examining the box, but must be learned from the diagram. Six steps, consisting of moving levers up and down, or back and forth, or in and out, and of pushing and turning knobs, were required to open the box (see diagram Figure III).

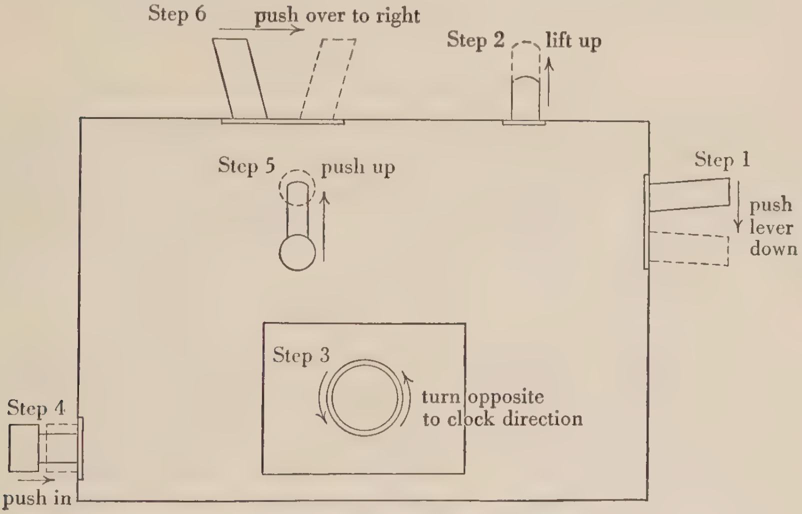


FIGURE III.—HAYES INSTRUCTION BOX DIAGRAM.

In administering the test, the box was first placed on the table in front of the subject, and the experimenter instructed him as follows:

"You see this box with a number of knobs and levers on it. If these knobs and levers are moved in just the right way and in just the right order, this little door on the front will open inward. I will give you a diagram that will show you how it is to be done. Notice that the arrows will show you in what direction the knobs and levers are to be moved, and the numbers will tell you in what order the steps are to be taken [the experimenter removes the box and presents the diagram to the subject]. I will give you one minute to study the diagram, and then I will take the diagram away and give you the box to see if you know how to open it."

The subject was allowed to study the diagram for one minute, after which the diagram was removed and the box presented for a trial. If the steps were correctly taken and the door opened on a first trial, the test was at an end. If not, the experimenter removed the box and gave back the diagram for another thirty seconds. The box was meanwhile reset for a new trial. If the second trial was also a failure, the same procedure as for the second trial was followed for a third trial. If the third trial was also a failure, the test was counted a failure. Only four steps can be used in evaluating the result: success on the first trial, on the second trial, on the third trial, and failure. The five-percentile scales appear in Tables 94 and 95.

The test is a good one of its type but unsatisfactory from the point of view of distribution of the measure. In the scale of average percentile rank it is used as one of eleven measures in the seventeen-year scale.

Freeman Puzzle Box

(5, p. 34)

The Freeman puzzle box was selected as the test of a mechanical type of ability at eighteen years. It is comparable with the Healy and Fernald box in that it is a mechanical problem which is to be solved by studying out the relationship of the various parts of the apparatus, all of which are in plain view through the glass cover. No principle other than that of

TABLE 96

FREEMAN PUZZLE BOX — TIME OF SOLUTION IN SECONDS

Boys — 18 years

Percentiles	
5	300+
10	300+
15	300+
20	300+
25	300+
30	300+
35	272.0
40	235.1
45	205.3
50	177.7
55	163.8
60	146.8
65	129.6
70	114.5
75	104.4
80	92.0
85	82.3
90	71.1
95	57.6
No. of Cases	336

TABLE 97

FREEMAN PUZZLE BOX — TIME OF SOLUTION IN SECONDS

Girls — 18 years

Percentiles	
5	300+
10	300+
15	300+
20	300+
25	300+
30	300+
35	300+
40	300+
45	300+
50	300+
55	292.3
60	249.6
65	230.3
70	199.4
75	176.0
80	143.5
85	118.0
90	104.4
95	83.2
No. of Cases	232

moving levers of varying degrees of complication is involved. Six moves are required to open the little door, and they must be performed in the correct order. In addition to the six necessary levers, there were two levers which complicated the solution without forming necessary steps in it. In making a record of the performance, a number from one to six was assigned to the six necessary levers and the letters *A* and *B* to the unnecessary ones. The course of the solution was recorded by noting in order the number or letter of the levers moved and marking the successful moves.

In administering the test, the box was placed on the table in front of the subject and the experimenter said: "The problem of this box is to get this little door in the front open by moving the levers in the right order and in the right direction. The door springs open of itself when you have moved the levers correctly. There is nothing hidden about the box. You can study out for yourself just how to do it. The levers move very easily when you find the right way, so don't use force. See how quickly you can get it done." The test was timed with the stop watch.

Although in this test also the method of solution was recorded and often throws an interesting light upon the subject, no way of using the record of method statistically was found. The measure used was the time required for solution, using a five-minute time limit. The limit of five minutes was decided upon as the result of preliminary trials. The box seemed very easy to us. However, the large number of failures suggests that more time should have been allowed.

This box also has defects of construction which prove trying. It is possible, by the application of a little force, to take several of the steps out of order. With use the levers become loosened, and the possibility of false solutions increased. No matter how earnest the warning not to use force, many subjects are sure to do it. The temptation seems to be irresistible. Then, too, force is a relative term, and just how much might be required to do it is an unknown quantity to the subject. The result was that a very large number of records had to be thrown out because the solution was forced.

The results are presented in terms of five-percentile summaries of the time required for solution, for boys and girls separately (Tables 96 and 97). In forming the scale of average percentile rank at eighteen years, this test constitutes one measure.

Visual Recognition

The recognition test was devised by Mr. Edward S. Jones while he was a member of the staff of the Bureau. The test was performed with cards the size of playing cards on which geometrical patterns were drawn. There were two packs of cards, one containing fifteen (Figure IV) and the other

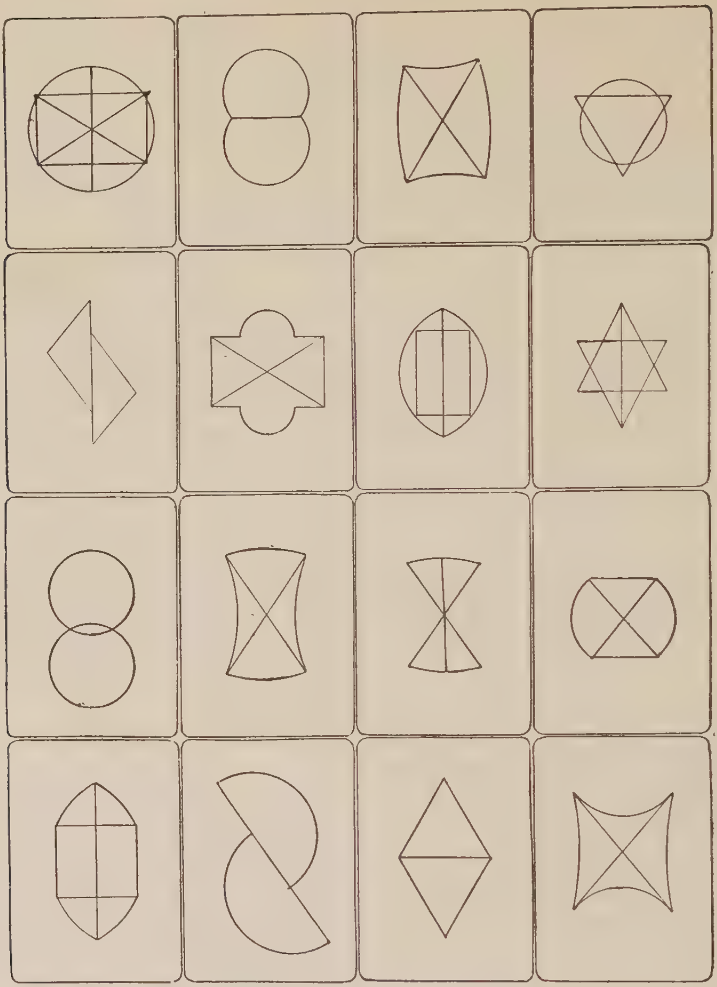


FIGURE IV.—RECOGNITION TEST.

The sample card (upper left corner) and the fifteen cards of the first pack, arranged in order of presentation, left to right.

twenty cards (Figure V), and an additional card used as a sample. Ten cards of the first pack were identical in pattern with ten in the second pack, while the others were different.

In administering the test, the experimenter sat at the table opposite the subject, and instructed him as follows: "I am going to show you a series of cards on each of which is a drawing, something like this [showing the sample card]. I want you to look at each one of these very carefully so that you will know them when you see them again; because after you have seen them all, I am going to show you a different pack of cards which

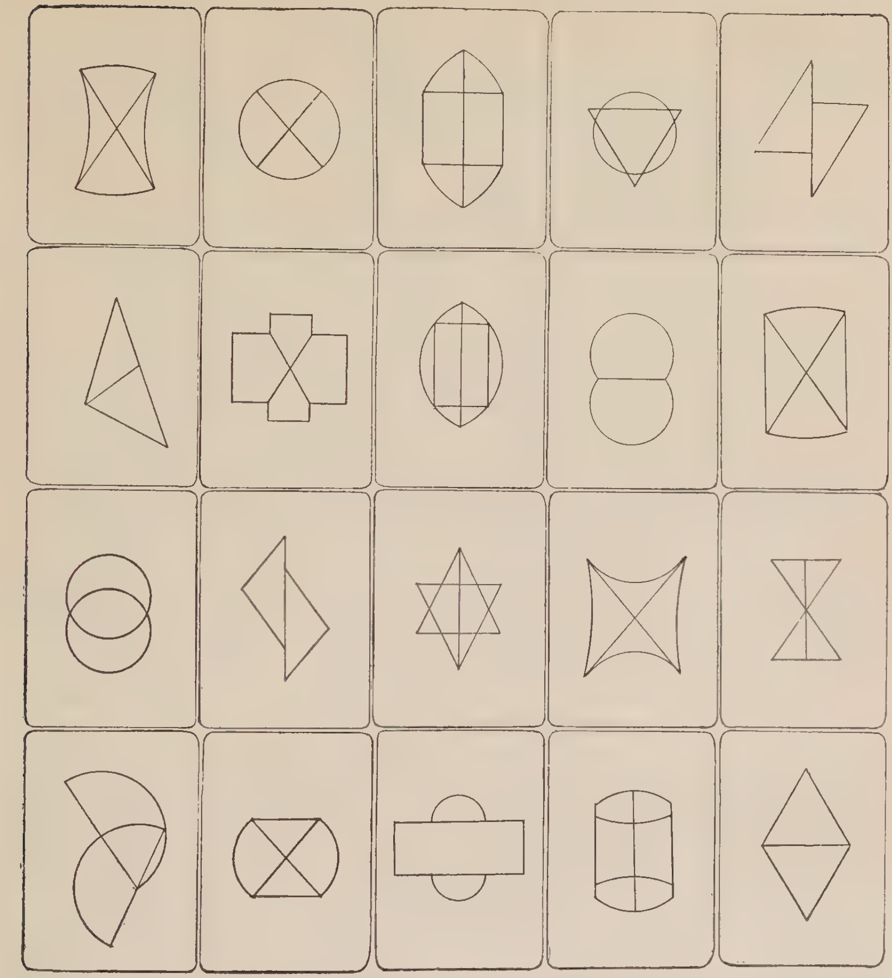


FIGURE V.—RECOGNITION TEST.

The twenty cards of the second pack, arranged in order of presentation, left to right.

contains some, but not all, of the same drawings, and also some different ones. I want you to try to pick out of the second pack all the drawings that you have seen before—that is, those that were in the first pack. I will show you the cards one at a time [shows the first pack, allowing five seconds to each card and having only one card at a time exposed]. Here is the second pack. Put the cards which you have seen on the right side and those that you have not seen on the left. Decide one way or the other each time. If you do not know, make the best guess you can."

It is obviously possible to make two kinds of errors in performing this test. One may err by including among those selected as seen, cards which

TABLE 98 — RECOGNITION

Boys — 18 years

PERCENTILES	Per Cent Correct	+ Errors	− Errors
5	13.3	6	3
10	23.6	5	3
15	30.5	4	2
20	33.6	4	2
25	37.0	4	2
30	40.3	3	2
35	42.4	3	1
40	44.5	3	1
45	46.6	3	1
50	48.7	3	1
55	51.0	2	1
60	53.5	2	1
65	56.0	2	0
70	58.5	2	0
75	61.4	1	0
80	64.7	1	0
85	68.0	1	0
90	72.6	0	0
95	79.0	0	0
No. of Cases	358	358	358
Median	48.7 ± .8 P. E.		
Q	12.2		

TABLE 99 — RECOGNITION

Girls — 18 years

PERCENTILES	Per Cent Correct	+ Errors	− Errors
5	11.0	6	3
10	18.3	6	3
15	22.6	5	2
20	26.1	5	2
25	29.6	4	2
30	33.6	4	2
35	37.4	4	1
40	41.1	3	1
45	44.1	3	1
50	47.2	3	1
55	50.2	3	1
60	52.6	2	0
65	54.9	2	0
70	57.3	2	0
75	59.6	2	0
80	63.4	1	0
85	67.5	1	0
90	71.8	1	0
95	76.4	0	0
No. of Cases	277	277	277
Median	47.2 ± 1.1 P. E.		
Q	15.0		

had not been seen (a positive error), or one may err by omitting from those selected as seen, cards which actually had been seen (a negative error). These two types of error were recorded separately. Sometimes one or the other type of error proved to be characteristic of an individual. On one occasion when some adults were being tested, a politician made three positive errors and no negative ones, and a scientist made one negative error and no positive ones! In general the tendency to positive errors is greater than the tendency to negative errors. In other words, it is easier to believe that you did see something which you did not see than it is to believe that you did not see something which you did see!

In evaluating the test, every error, positive or negative, meant a deduction of 10 per cent from a score of 100. There were twenty judgments to be made, ten with regard to cards previously seen and ten with regard to cards not previously seen. If all twenty judgments were correct, the score would be 100. If all twenty judgments were wrong, the score would be —100. Although it was theoretically possible to make a negative score, there were but 5 children, 2 boys and 3 girls, who did so. In the scale of measurement only the per cent correct is used (Tables 98 and 99). The results are presented in five-percentile summaries of per cent correct and of the number of positive and negative answers. The test is used as one of fifteen measures in the eighteen-year scale of average percentile rank.

AUSSAGE

(1, TEST 32; 6)

The *Aussage* test has been widely used as a measure of the accuracy of observation and report. It is a test which involves the correct understanding of the material presented—either in picture form or as a narrative—and the ability to reproduce. In this instance, the test consists in having the subject listen to a simple narrative and then attempt to reproduce it as accurately as possible. The narrative was written with local color designed to hold the interest and attention of Cincinnati youth.

In administering the test, the experimenter instructed the subject as follows: "I am going to read a short account of something which happened and I want you to try to remember exactly what did happen, and the order in which things happened. After I finish reading you the account, I want you to tell it to me in your own words just as accurately as you can. Try to see how near you can come to telling it to me just the way I read it to you."

The passage was as follows:

> While I was walking with my dog along the road near the reservoir in Eden Park, I heard a distant noise just like that of a motor-boat on the Ohio River.
>
> Just then I noticed an approaching automobile whose chauffeur was paying more attention to something up in the air than to driving his machine. Although my first

impulse was to follow his gaze, I was quickly brought to my senses by his reckless steering which almost resulted in running over my dog. When I finally did look up I discovered the cause of the noise I had heard some time before. It was a large aeroplane which had come from up the river and was flying straight towards a hill on the Kentucky side where it finally landed.

After the passage had been read as expressively as possible by the experimenter, the subject repeated it aloud, while the experimenter noted down word for word what he said, using as many abbreviations as he could. It was often necessary to ask the subject to speak a little more slowly.

The test was evaluated in terms of the percentage of ideas correctly reproduced. The passage was divided into *ideas* to each of which a numerical value from 1 to 4 was assigned. The value 1 was assigned to an idea which was very easy to remember because it was essential to the understanding of the narrative—a crucial point. On the other hand, 4 was assigned to an idea which might easily be omitted without modifying the situation essentially, and was therefore much harder to remember. The sum of the assigned values was 100. The following key shows the division into *ideas* and the value assigned to each. The numbers in parentheses indicate that partial credit may be assigned. For instance, if instead of saying that the narrator was walking *along the road*, the subject reported that he was walking *near the road* a partial value of 2 points could be assigned.

AUSSAGE TEST

2 2 (2) 4 (2) 4 4
I was *walking with my dog along the road near* the *reservoir* in *Eden Park.*
3 1 4 4 4 (2) 4 4
I heard a noise distant like a *motor-boat* on the *Ohio River. Just then I saw* an *approaching*
4 2 2 (2) 4 2
automobile whose *chauffeur* was *paying attention* to *something up in the air more* than to
2 2 2 1
driving his machine. Although my *first impulse* was to *follow his gaze,* I was *quickly*
3 2 3 3
brought to my senses by his *reckless steering* which *almost resulted* in *running over my dog.*
1 1 2 4
When I *finally looked up* I *discovered* the *cause of the noise* I *had heard before.* It was
1 3 2 2 2 (2) 3
a *large aeroplane* which *had come from up the river* and was *flying towards a hill* on the
3 4
Kentucky side where it *finally landed.*

128 words
100 points credit

Steam-boat given 2 and counted as an error

The only numerical measure of the test used is that of the score for correct ideas (Tables 100 and 101). In giving the test, note should also be made of the insertion of ideas not contained in the original passage. Such errors are very significant in estimating the individual subject, though they do not lend themselves easily to numerical summaries. Sometimes the narrative was so transformed as to be scarcely recognizable and yet the subject expressed himself as confident that he was correct.

In forming the scale of average percentile rank in mental tests, the *Aussage* test is used as one measure of fifteen at eighteen years.

TABLE 100

AUSSAGE TEST

Boys — 18 years

Percentiles	Per Cent Correct Ideas
5	33.8
10	42.3
15	45.5
20	49.4
25	52.7
30	55.5
35	56.4
40	59.2
45	61.0
50	62.5
55	64.0
60	65.4
65	67.1
70	68.7
75	70.4
80	73.1
85	76.5
90	79.8
95	84.3
No. of Cases	355
Median	62.5 ± .6 P. E.
Q	8.9

TABLE 101

AUSSAGE TEST

Girls — 18 years

Percentiles	Per Cent Correct Ideas
5	26.0
10	35.4
15	40.5
20	44.7
25	47.8
30	50.5
35	53.1
40	55.7
45	58.8
50	61.7
55	64.2
60	66.5
65	68.5
70	70.5
75	72.4
80	74.2
85	76.1
90	80.4
95	84.6
No. of Cases	278
Median	61.7 ± .9 P. E.
Q	12.3

HARD DIRECTIONS

(7)

The hard-directions blank of Woodworth and Wells was used for this test. The blank reads as follows:

With your pencil make a dot over any one of these letters F G H I J, and a comma after the longest of these three words: boy mother girl. Then, if Christmas comes in March, make a cross right here ...... but if not, pass along to the next question, and tell where the sun rises ..... If you believe that Edison discovered America, cross out what you just wrote, but if it was some one else, put in a number to complete this sentence: "A horse has .... feet." Write yes no matter whether China is in Africa or not ....; and then give a wrong answer to this question: "How many days are there in the week?" .... Write any letter except g just after this comma, and then write no if 2 times 5 are 10 ...... Now, if Tuesday comes after Monday, make two crosses here ....; but if not, make a circle here .... or else a square here

.... Be sure to make three crosses between these two names of boys: George .... Henry. Notice these two numbers: 3, 5. If iron is heavier than water, write the larger number here .... but if iron is lighter write the smaller number here ...... Show by a cross when the nights are longer: in summer? ...... in winter? ...... Give the correct answer to this question: "Does water run uphill? ...... and repeat your answer here ..... Do nothing here (5+7= ......), unless you skipped the preceding question; but write the first letter of your first name and the last letter of your last name at the end of this line:

In administering the test, the experimenter laid the blank face down on the table in front of the subject, and instructed him as follows: "On the other side of this paper there are some instructions which I want you to carry out. The idea is to see how fast you can read the instructions and in each case do what you are told to do. For instance, you might find this instruction. 'Draw a line around the three dots ....'[The experimenter writes this sentence on the back of the blank.] You would do it like this [illustrates]. Or you might read 'Write any word of three letters,' and you would write—what? Yes, that is right. I will keep your time so that we can see how quickly as well as how carefully you can do everything that is there." A time limit of ten minutes was set on this test.

Two scores were made out for this test, the time in seconds required to complete the page and the number of correct responses (Tables 102 and 103). Since there are just twenty instructions on the page, twenty constitutes a perfect score. The test is a good one from various points of view. The results are well-distributed, the correlations with school grade and the contrast between working and school groups are high. In making up the scale of average percentile ranks for eighteen years, both time and number correct were used as measures, giving the test a weight of two out of fifteen measures.

Yerkes Point Scale

(8, 9, 10)

It seemed desirable to have some form of comparison between results on a scale of the type of the Binet and our own. Accordingly at eighteen years we included the Yerkes Point Scale as one element in the examination for a portion of our series. We were particularly interested in giving this scale to those of lowest mental rank. In the working series, 159 boys and 114 girls were given the Yerkes Point Scale. In each case about 60 per cent of those who received the Yerkes Point Scale examination were children who had ranked below average on our own scale in previous years. A special effort was made to test all those who had failed worst in the other type of examination. No conscious selection of the representatives of the school group was made. Forty-nine school boys and forty-three school girls were examined. For both series the sample selected constituted more

TABLE 102 — HARD DIRECTIONS

Boys — 18 years

Percentiles	Time in Seconds	No. Correct
5	464.7	7
10	408.5	8
15	361.8	10
20	331.7	11
25	301.8	12
30	282.6	12
35	274.7	14
40	254.7	14
45	244.4	14
50	232.0	15
55	219.3	15
60	207.5	16
65	196.8	16
70	185.6	17
75	174.4	17
80	163.0	18
85	150.8	18
90	138.6	19
95	119.4	19
No. of Cases	358	359
Median	232.0 ± 4.2 P. E.	15 ± .17 P. E.
Q	63.7	2.5

TABLE 103 — HARD DIRECTIONS

Girls — 18 years

Percentiles	Time in Seconds	No. Correct
5	389.3	10
10	329.8	11
15	295.9	12
20	275.1	13
25	257.7	14
30	244.6	15
35	231.1	15
40	221.7	15
45	214.9	16
50	202.8	16
55	189.5	17
60	179.7	17
65	172.1	18
70	163.0	18
75	149.2	18
80	139.4	19
85	129.6	19
90	120.2	19
95	113.1	20
No. of Cases	274	277
Median	202.8 ± 4.0 P. E.	16 ± .15 P. E.
Q	54.3	2.0

than half of the entire group. A larger percentage of the total school group than of the total working group is included in the general scale.

Haine's (9) estimation of the mental age values of Yerkes Point Scale scores is the one we adopted in interpreting scores as mental ages. His scale is as follows:

Age	Points
8 years	41–55
9 years	56–61
10 years	62–64
11 years	65–76
12 years	77–78
13 years	79–80
14 years	81
15 years	82–83
16 years	84–85
17 years	86–87
18 years	88+

In our series (Tables 104 and 105), 5 per cent of the girls have mental ages below ten years and 10 per cent of them below eleven years. The boys have a somewhat smaller proportion of very inferior individuals, but only a little less than 5 per cent rank below ten years mentally, and a little less than 10 per cent below eleven years. The median mental age for boys falls

TABLE 104

YERKES POINT SCALE

Boys — 18 years

Percentiles	Score
5	62.5
10	67.3
15	70.4
20	72.1
25	73.9
30	75.6
35	77.4
40	79.2
45	80.6
50	81.7
55	82.8
60	83.9
65	85.1
70	86.8
75	88.5
80	90.3
85	92.3
90	94.3
95	98.0
No. of Cases	208

TABLE 105

YERKES POINT SCALE

Girls — 18 years

Percentiles	Score
5	58.9
10	64.2
15	69.1
20	72.0
25	74.5
30	76.7
35	78.9
40	80.8
45	82.4
50	83.9
55	85.5
60	86.9
65	88.4
70	89.8
75	91.0
80	92.2
85	93.3
90	94.5
95	96.8
No. of Cases	157

at fifteen years and for girls at sixteen years. The proportion with "mental ages" of eighteen or more is 25 per cent of the boys and 35 per cent of the girls.

What this outcome probably means is that a median score of 88 for the entire group of eighteen-year-old individuals in the community is too high an expectation. The correct expectation is about 83. However, the scale is entirely too easy for the superior members of the group and therefore does not give a correct picture of the contrast between superior and inferior individuals. Moreover, the differences in score between one year's rating and the next are too small to be taken very seriously.

TABLE 106

MENTAL TESTS: SCALE OF AVERAGE PERCENTILE RANKS

Boys

PERCENTILES	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	23.5	25.5	27.8	27.1	27.9
10	29.3	31.1	30.1	31.4	34.0
15	33.6	33.7	34.1	34.5	37.7
20	37.2	36.5	37.3	37.6	40.7
25	40.6	39.2	40.3	40.6	43.5
30	43.4	42.0	42.9	42.9	45.7
35	46.0	44.7	45.4	47.7	49.3
40	48.3	47.3	47.8	48.0	50.9
45	50.7	49.8	50.1	50.5	53.5
50	53.7	52.0	52.1	53.0	56.0
55	55.5	54.2	54.2	55.5	58.2
60	58.0	56.3	56.5	58.4	60.5
65	60.5	58.4	59.2	61.3	63.1
70	62.8	60.7	62.0	64.2	65.8
75	65.3	63.6	64.7	66.6	68.8
80	67.9	66.8	67.7	68.6	71.5
85	70.8	70.5	70.7	71.8	74.0
90	74.1	74.5	74.4	76.0	77.5
95	80.5	79.4	78.7	80.8	81.6
No. of Cases . .	871	685	637	487	370
Median	53.7 ± .53 P. E.	52.0 ± .60 P. E.	52.1 ± .61 P. E.	53.0 ± .74 P. E.	56.0 ± .83 P. E.
Q	12.4	12.2	12.2	13.0	12.7

It is interesting to note in passing what would happen to this group if the old limit for mental deficiency among adults—a mental age of twelve years—were maintained. About 30 per cent of the population would be ranked as feeble-minded. Since the Yerkes Point Scale is more lenient in its marking than the Stanford Revision, it follows that a still larger proportion of the population would rank as feeble-minded on that basis. Making the best comparison we could between the two types of rating, we estimated that about 40 per cent of the adult population ranks below twelve years on the scale of the Stanford Revision (10). The army tests have since shown that this estimate is not far wrong.

TABLE 107

MENTAL TESTS: SCALE OF AVERAGE PERCENTILE RANKS

Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	24.5	25.0	23.1	23.4	28.3
10	31.1	30.3	29.7	28.3	31.8
15	35.1	34.3	33.0	32.8	35.8
20	37.9	37.8	36.4	36.7	39.5
25	40.8	40.7	40.1	39.8	42.6
30	43.5	42.9	42.3	43.2	45.3
35	46.3	44.9	44.6	46.1	46.0
40	49.0	47.0	47.1	48.4	50.2
45	51.4	49.0	49.6	50.7	52.1
50	53.5	51.3	52.6	53.0	54.1
55	55.1	53.7	55.6	55.0	56.5
60	58.3	56.2	57.9	58.7	59.3
65	60.6	58.9	60.2	61.5	62.0
70	63.3	61.2	62.2	64.2	64.9
75	65.4	63.4	64.1	67.0	67.3
80	68.3	65.8	66.7	69.8	69.7
85	71.2	69.1	69.7	73.2	72.5
90	74.3	73.3	74.6	76.8	75.6
95	79.7	77.8	81.0	80.8	81.5
No. of Cases	664	542	535	407	285
Median	53.5 ± .60 P. E.	51.3 ± .61 P. E.	52.6 ± .65 P. E.	53.0 ± .84 P. E.	54.1 ± .92 P. E.
Q	12.3	11.4	12.0	13.6	12.4

THE SCALE OF MENTAL ABILITY IN TERMS OF AVERAGE PERCENTILE RANK

The method of combining the separate measures of mental ability into a single measure, is the same as that adopted in the case of the tests of physical skill (see Chapter III). Each individual was assigned a percentile rank for each of his scores in mental tests. These percentile ranks were then averaged for each individual. A sample case, that of John Brown, a fourteen-year-old boy, will illustrate the method of arriving at the average percentile rank.

Illustrative Case for Finding Average Percentile Rank in Mental Ability

TEST	Score	Percentile Rank	Weight of Percentile Rank in Scale
Cancellation			
Index	165	90 } Median 85	85
Accuracy . . .	96	80	
Substitution			
Page 1	151		
Page 2	105		
Page 3	94		
Sum of practice pages	350	75	75
Page 4			
Accuracy . .	100	100 } Median 87.5	87.5
Index	88	75	
Memory			
7 place	90		
8 place	92		
9 place	64		60
	246	60	60
Opposites			30
Corrected accuracy . . .	86	30	30
Sentences			
Index	12	40	40
Association time	5	50	50
			9)517.5
Average percentile rank			57.5

When an average percentile rank had been attained for each individual of a given age, the average percentile ranks were themselves arranged in a five-percentile scale (Tables 106 and 107). It thus became possible to assign to each individual a percentile rating of his mental tests which placed him with reference to other individuals of his own age. Our John Brown, with an average percentile rank of 57.5, falls in the sixtieth percentile of boys of his age in the excellence of his performance of these tests. In other words, 40 per cent of the boys of his age did the tests better than he and 60 per cent did them less well than he. In so far as rating in such a group of tests as these can be taken as a measure of mental ability in the community, we can say that John's ability is somewhat above average—as good as 60 per cent of persons of his age and sex.

The measures used were as follows for each age:

YEAR 14

Cancellation	
Median between index and accuracy	1 measure
Substitution	
Index-sum of practice pages (1, 2, and 3)	1 measure
Memory page—median between index and accuracy	1 measure
Memory	
Sum of 7-, 8-, and 9-place series (used twice)	2 measures
Opposites	
Corrected accuracy (used twice)	2 measures
Sentences	
Index	1 measure
Association time	1 measure
	9 measures

Of the nine measures, seven were required in taking the average. Cases in which fewer than seven measures had been made were omitted in forming the scale of average ranks.

YEAR 15

Cancellation	
Median between index and accuracy	1 measure
Substitution	
Index-sum of practice pages (1, 2, and 3)	1 measure
Memory page—median between index and accuracy	1 measure
Memory	
Sum of 7-, 8-, and 9-place series (used twice)	2 measures
Opposites	
Corrected accuracy (used twice)	2 measures
Sentences	
Index	1 measure
Association time	1 measure
Puzzle Box (used twice)	2 measures
	11 measures

Of the eleven measures at fifteen years, seven were required in taking the average for use in the final scale. Cases in which fewer than seven measures had been made were omitted from the final scale.

YEAR 16

Cancellation	
Median between index and accuracy	1 measure
Substitution	
Index-sum of practice pages (1, 2)	1 measure
Memory page—median between index and accuracy	1 measure
Memory	
Sum of 7-, 8-, and 9-place series (used twice)	2 measures
Cause and Effect	
Per cent correct (used twice)	2 measures
Sentences	
Index	1 measure
Association time	1 measure
Flower-Pot Construction Puzzle	1 measure
	10 measures

Of the ten measures of year sixteen, six were required for the average percentile rank. Individuals whose records showed that less than six measures had been made, were omitted from the scale of average percentile ranks.

YEAR 17

Cancellation	
Median between index and accuracy	1 measure
Substitution	
Index-sum of practice pages (1, 2)	1 measure
Memory page—median between index and accuracy	1 measure
Memory	
Sum of 7-, 8-, and 9-place series (used twice)	2 measures
Mutilated Text	
Time	1 measure
Accuracy	1 measure
Instruction Box	
Number of trials	1 measure
Hard Opposites	
Accuracy (used twice)	2 measures
Chick and Boat Construction Puzzles	
Time—median between the two percentile ranks	1 measure
	11 measures

Of the eleven measures of year seventeen, seven were required in taking an average. Individuals whose records showed less than seven measures were omitted from the average.

YEAR 18

Cancellation	
Median between index and accuracy	1 measure
Substitution	
Index-sum of practice pages (1, 2)	1 measure
Memory page—median between index and accuracy	1 measure
Memory	
Sum of 7-, 8-, and 9-place series (used twice)	2 measures
Opposites	
Corrected accuracy—easy list	2 measures
Hard Instructions	
Number correct	1 measure
Time	1 measure
Mutilated Text	
Accuracy	1 measure
Time	1 measure
Recognition	
Percentage correct	1 measure
Freeman Puzzle Box	
Time	1 measure
Aussage	
Percentage correct	1 measure
Cradle and Seal Construction Puzzles	
Time—median between the two ranks	1 measure
	15 measures

Of the fifteen measures of year eighteen, ten were required in taking an average. Individuals whose records showed that less than ten measures had been made, were omitted in forming the scale of average percentile ranks.

In presenting the scales at the close of this chapter (Tables 108–117) for convenience in use, the fractions which represent theoretical values have been discarded, and the scale is presented in terms of the actual scores which an individual may receive. For instance, in the accuracy of page 4, the memory page of the substitution test, the actual scores must be even numbers, since there are just fifty figures on page 4 and a single error means a loss of 2 per cent in accuracy. The theoretical division into percentiles does not, of course, correspond with actual scores. In assigning a percentile rank, the theoretical percentile must be interpreted as equivalent to the nearest actual score. Thus the five-percentile value—60.8 (scale for fourteen-year-old boys)—must be interpreted as equivalent to 60 in assigning percentile ranks. Any individual having an accuracy of 60 or less would thus be given a percentile rank of 5. At the upper end of the same percentile

TABLE 108

SCALE OF MENTAL MEASUREMENT

Boys — 14 Years

PERCENTILES	CANCELLATION		SUBSTITUTION			Memory Sum of 7–8–9	Opposites Corrected Accuracy	SENTENCES		Average Per. Rank
	Index	Accuracy	Index Pages 1–2–3	Index Page 4	Acc. Page 4			Index	No. of Sentences In 2′ or Less	
5	376	54	573	272	60	165	58.7	23.2	0	23.5
10	330	64	529	213	70	181	69.8	18.0	1} rank	29.3
15	299	70	496	180	76	192	76.6	16.0	1} 15	33.6
20	281	74	478	157	82	200	81.2	14.6	2} rank	37.2
25	267	76	461	144	86	208	84.4	13.8	2} 25	40.6
30	256	80	446	133	88	214	86.8	13.0	3} rank	43.4
35	245	82	432	123	92	220	88.7	12.3	3} 35	46.0
40	236	84	420	117	94	226	90.6	11.6	4	48.3
45	227	86	410	111	96} rank	231	92.4	11.0	5} rank	50.7
50	219	88} rank	399	106	96} 55	236	94.2	10.4	5} 50	53.7
55	213	88} 55	389	101	96}	241	95.9	10.0	6} rank	55.5
60	206	90	378	97	98} rank	246	97.3	9.6	6} 60	58.0
65	199	92} rank	369	93	98} 70	251	98.7	9.1	7	60.5
70	193	92} 70	358	90	98}	256	100.1	8.7	8} rank	62.8
75	186	94	347	86	100}	262	102.1	8.2	8} 75	65.3
80	179	96	336	83	100} rank	268	104.4	7.8	9	67.9
85	170	98} rank	324	76	100} 100	277	106.8	7.3	10	70.8
90	162	98} 90	306	72	100}	285	109.1	6.9	11	74.1
95	147	100 rank 100	284	65	100}	294	116.7	6.0	12	80.5

TABLE 109

SCALE OF MENTAL MEASUREMENT

Boys — 15 Years

PERCENTILES	CANCELLATION		SUBSTITUTION			Memory Sum of 7–8–9	Opposites Corrected Accuracy	SENTENCES		Puzzle Box Time	Average Per. Rank
	Index	Accuracy	Index Pages 1–2–3	Index Page 4	Acc. Page 4			Index	Assoc. Time		
5	249	80	525	255	62	177	73.6	20.9	0	600+ rank 5	25.5
10	231	86	483	206	72	194	83.4	16.9	1 rank 15	600+	31.1
15	218	88	456	164	80	206	89.7	14.8	1	600+	33.7
20	210	90	436	147	84	216	92.8	13.5	2 rank 25	504	36.5
25	201	92 rank 30	420	131	88	223	95.5	12.4	2	413	39.2
30	194	92	407	119	90	228	98.1	11.6	4	369	42.0
35	187	94 rank 40	393	113	94 rank 40	234	100.8	10.7	5	334	44.7
40	180	94	379	108	94	239	103.6	10.2	6 rank 45	299	47.3
45	175	96 rank 60	369	102	96 rank 50	244	106.5	9.7	6	275	49.8
50	169	96	361	98	96	248	109.3	9.2	7	251	52.0
55	164	96	352	94	98 rank 60	253	112.3	8.7	8 rank 60	229	54.2
60	158	96	339	90	98	258	115.5	8.3	8	205	56.3
65	153	98 rank 85	331	86	100 rank 100	263	118.7	8.0	9 rank 70	188	58.4
70	148	98	321	82	100	268	122.3	7.6	9	171	60.7
75	143	98	311	78	100	273	126.7	7.3	10 rank 80	155	63.6
80	137	98	300	74	100	278	131.4	6.9	10	139	66.8
85	131	98	286	70	100	283	137.2	6.5	11	123	70.5
90	125	100 rank 100	272	66	100	289	144.0	6.2	12 rank 95	107	74.5
95	115	100	257	62	100	299	156.1	5.8	12	100	79.4

TABLE 110

SCALE OF MENTAL MEASUREMENT

Boys — 16 Years

PERCENTILES	CANCELLATION		SUBSTITUTION			Memory Sum of 7-8-9	Cause and Effect Per Cent Correct	SENTENCES		Flower-Pot Time	Average Per. Rank
	Index	Accuracy	Index Pages 1-2-3	Index Page 4	Acc. Page 4			Index	Assoc. Time		
5	281	74	337	295	58	203	36.7	20.7	0	225	27.8
10	251	80	315	215	70	215	50.0	16.4	1	158	30.1
15	235	82	301	182	78	224	60.0	14.6	2	123	34.1
20	224	86	287	158	82	233	66.7	13.3	3 rank	104	37.3
25	215	88 rank	278	144	86	241	70.0	12.0	3 25	92	40.3
30	207	88 30	270	128	88	247	76.7	11.3	4	82	42.9
35	200	90 rank	262	117	92	252	80.0	10.6	5 rank	74	45.4
40	194	90 40	254	111	94 rank	257	83.3 rank	9.9	5 40	70	47.8
45	189	92 rank	245	106	94 45	262	83.3 45	9.4	6 rank	64	50.1
50	184	92 50	237	100	96 rank	266	86.7	9.0	6 50	59	52.1
55	178	94	231	96	96 55	270	90.0	8.5	7	55	54.2
60	174	96	225	91	98 rank	274	93.3 rank	8.2	8	51	56.5
65	169	96 rank	220	87	98 65	279	93.3 65	7.8	9	47	59.2
70	163	96 70	214	83	100	282	96.7 rank	7.4	10 rank	44	62.0
75	160	98	208	79	100	285	96.7 75	7.0	10 75	41	64.7
80	153	98 rank	201	74	100	288	100.0	6.6	11	37	67.7
85	147	98 85	194	70	100 rank	291	100.0	6.2	12	34	70.7
90	141	98	185	65	100 100	297	100.0 rank	5.7	13 rank	31	74.4
95	130	100 rank 100	169	61	100	300	100.0 100	5.2	13 100	24	78.8

TABLE 111

SCALE OF MENTAL MEASUREMENT

Boys — 17 Years

PERCENTILES	CANCELLATION		SUBSTITUTION			Memory Sum of 7–8–9	MUTILATED-TEXT		Instruction Box No. of Trials	Hard Opposites Acc in Per Cent	CONSTRUCTION PUZZLES		Average Per. Rank
	Index	Accuracy	Index Pages 1–2	Index Page 3	Acc. Page 3		Time	Acc.			Chick Time	Boat Time	
5	276	78	340	281	70	196	505	18.8	Failure	10.5	300+ rank 5	300+ rank 5	27.1
10	259	84	314	210	72	211	497	25.0	3 rank 15	17.5	300+	300+	31.4
15	239	86	296	173	78	222	489	31.3	3	22.5	300+	300+	34.5
20	227	88	282	150	82	232	481	34.4	3	27.5	300+	300+	37.6
25	216	90	271	137	86	240	446	43.8	2 rank 40	32.5	300+	300+	40.6
30	206	92 rank 35	264	126	90	247	418	46.9	2	35.0	292	300+	42.9
35	198	92	256	118	92	253	393	50.0	2	40.0	248	274	47.7
40	193	94 rank 45	249	111	94	259	368	53.1	2	42.5	212	235	48.0
45	187	94	243	105	96 rank 55	265	342	59.4	2	45.0	182	201	50.5
50	182	96 rank 65	238	100	96	270	318	62.5	2	50.0	159	177	53.0
55	177	96	232	94	96	274	299	68.8	2	52.5	139	150	55.5
60	173	96	226	90	98	278	281	71.9 rank 65	1 rank 80	57.5	120	127	58.4
65	168	96	220	87	100 rank 100	282	260	71.9	1	60.0	106	111	61.3
70	164	98 rank 85	214	83	100	285	239	78.1	1	65.0	93	98	64.2
75	159	98	207	80	100	288	222	81.3	1	67.5	82	86	66.6
80	153	98	201	76	100	293	206	84.4	1	72.5	73	74	68.6
85	147	98	193	72	100	300	186	90.6	1	77.5	65	63	71.8
90	142	100 rank 100	185	67	100	300	164	93.8	1	82.5	56	53	76.0
95	128	100	176	62	100	300	132	96.9	1	90.0	44	42	80.8

TABLE 112

SCALE OF MENTAL MEASUREMENT

Boys — 18 Years

PERCENTILES	CANCELLATION		SUBSTITUTION			Memory Sum of 7-8-9	MUTILATED TEXT		Easy Opposites	HARD DIRECTIONS		RECOGNITION	FREEMAN BOX	AUSSAGE	CONSTRUCTION PUZZLES		Aver. Per. Rank
	Index	Accuracy	Index Pages 1-2	Index Page 3	Acc. Page 3		Time	Acc.		Time	No. Correct	Per Cent Correct	Time	Per Cent Correct	Time Cradle	Time Seal	
5	211	88	340	273	68	196	491	18.8	82.5	465	7	10	300+	34	300+	300+	27.9
10	195	90	311	202	76	216	462	21.9	85.0	409	8	20	300+	42	300+	300+	34.0
15	186	92	295	181	80	228	396	37.5	87.5	362	10	30 rank 20	300+ rank 5	46	300+	300+	37.7
20	177	94	285	151	84	235	364	40.6	90.0	332	11	30	300+	49	300+	300+	40.7
25	170	96	274	139	88	242	339	43.8	92.5 rank 30	302	12 rank 30	40	300+	53	300+ rank 5	300+	43.5
30	163	96	264	131	90	249	318	46.9	92.5	283	12	40 rank 40	300+	56 rank 35	300+	300+	45.7
35	157	96 rank 50	253	121	94	255	299	50.0	95.0	275	14	40	272	56	300+	300+ rank 5	49.3
40	153	96	246	113	96	261	278	56.3	95.0 rank 45	255	14 rank 45	40	235	59	300+	300+	50.9
45	149	96	239	106	98 rank 50	266	261	56.3	95.0	244	14	50	205	61	300+	300+	53.5
50	144	96	233	100	98	271	244	59.4	97.5	232	15 rank 55	50 rank 60	178	63	291	300+	56.0
55	140	98	227	94	100	275	227	62.5	97.5 rank 65	219	15	50	164	64	274	300+	58.2
60	136	98	221	89	100	279	209	65.6	97.5	208	16 rank 65	50	147	65	236	300+	60.5
65	132	98 rank 80	216	85	100	283	194	68.8	97.5	197	16	60	130	67	203	300+	63.1
70	128	98	210	81	100 rank 100	286	180	71.9	100.0	186	17 rank 75	60 rank 80	115	69	175	263	65.8
75	124	98	205	77	100	287	166	75.0	100.0	174	17	60	104	70	155	230	68.8
80	120	98	199	73	100	294	152	81.3	100.0 rank 100	163	18 rank 85	60	92	73	133	200	71.5
85	114	100	190	69	100	300	133	84.4	100.0	151	18	70 rank 90	82	77	119	167	74.0
90	109	100 rank 100	181	65	100	300 rank 100	115	87.5	100.0	139	19 rank 100	70	71	80	103	142	77.5
95	103	100	167	61	100	300	96	93.8	100.0	119	19	80	58	84	83	110	81.6

TABLE 113

SCALE OF MENTAL MEASUREMENT

Girls — 14 Years

PERCENTILES	CANCELLATION		SUBSTITUTION			Memory Sum of 7–8–9	Opposites Corrected Accuracy	SENTENCES		Average Per. Rank
	Index	Accuracy	Index Pages 1–2–3	Index Page 4	Acc. Page 4			Index	No. of Sentences In 2″ or Less	
5	334	52	575	283	60	165	60.5	21.3	0	24.5
10	301	62	527	215	74	185	75.1	17.9	1 rank	31.1
15	276	68	497	180	80	197	78.4	16.3	1 15	35.1
20	260	74	475	159	84	205	82.0	14.8	2 rank	37.9
25	246	76	457	147	86	212	84.9	13.8	2 25	40.8
30	235	78	442	136	90	218	87.3	12.8	3	43.5
35	227	80	427	127	92	224	89.6	12.1	4 rank	46.3
40	218	82	416	119	94	230	91.7	11.5	4 40	49.0
45	210	84	406	114	96 rank	236	93.6	10.9	5 rank	51.4
50	201	86	397	109	96 50	241	95.4	10.4	5 50	53.5
55	195	88	388	104	98	246	96.7	9.9	6	55.1
60	188	90 rank	378	99	98 rank	251	98.0	9.4	7 rank	58.3
65	182	90 65	368	95	98 65	256	99.3	8.9	7 65	60.6
70	174	92	356	91	100	261	100.6	8.5	8 rank	63.3
75	167	94 rank	343	87	100	266	103.7	8.0	8 75	65.4
80	160	94 80	330	82	100 rank	272	106.7	7.6	9	68.3
85	152	96	316	77	100 100	279	109.7	7.2	10	71.2
90	144	98 rank	301	71	100	285	116.6	6.7	11	74.3
95	131	98 95	279	65	100	294	124.7	5.9	12	79.7

TABLE 114

SCALE OF MENTAL MEASUREMENT

Girls — 15 Years

PERCENTILES	CANCELLATION		SUBSTITUTION			Memory Sum of 7-8-9	Opposites Corrected Accuracy	SENTENCES		Puzzle Box Time	Average Per. Rank
	Index	Accuracy	Index Pages 1-2-3	Index Page 4	Acc. Page 4			Index	Assoc. Time		
5	217	80	534	249	64	182	72.5	21.1	0 rank 5	600+ rank 5	25.0
10	196	86	472	187	76	199	85.4	17.4	0	600+	30.3
15	186	88	443	157	82	208	91.8	15.3	1 rank 20	600+	34.3
20	177	90	423	142	86	214	95.3	13.5	1	600+	37.8
25	171	92 rank 30	410	132	90	220	98.7	12.2	2	600+	40.7
30	165	92	396	122	92	227	101.6	11.3	3	600+	42.9
35	159	94 rank 40	386	115	94	233	104.0	10.5	4	600+	44.9
40	155	94	376	109	96 rank 45	239	106.3	10.0	5 rank 45	544	47.0
45	150	96 rank 60	365	102	96	245	108.7	9.5	5	481	49.0
50	146	96	354	98	98 rank 60	251	111.1	9.0	6 rank 55	436	51.3
55	142	96	346	93	98	256	114.0	8.5	6	392	53.7
60	138	96	338	89	98	261	116.8	8.2	7	356	56.2
65	134	98 rank 85	331	85	100 rank 100	265	119.8	7.8	8 rank 70	320	58.9
70	130	98	322	81	100	270	124.5	7.4	8	287	61.2
75	126	98	311	77	100	275	130.0	7.0	9	257	63.4
80	122	98	299	73	100	281	136.4	6.7	10	226	65.8
85	117	98	287	68	100	285	143.0	6.3	11	195	69.1
90	109	100 rank 100	273	64	100	289	149.7	6.1	12 rank 95	158	73.3
95	102	100	254	58	100	300	165.8	5.8	12	121	77.8

TABLE 115

SCALE OF MENTAL MEASUREMENT

Girls — 16 Years

PERCENTILES	CANCELLATION		SUBSTITUTION			Memory Sum of 7–8–9	Cause and Effect Per Cent Correct	SENTENCES		Flower-Pot Time	Average Per. Rank
	Index	Accuracy	Index Pages 1–2–3	Index Page 4	Acc. Page 4			Index	Assoc. Time		
5	281	72	354	303	50	203	40.0	19.6	0	300	23.1
10	251	78	323	243	64	220	53.3	16.1	1	204	29.7
15	235	82	305	205	74	229	60.0	13.9	2	164	33.0
20	224	86 rank	291	181	78	238	66.7	12.4	3	139	36.4
25	215	86 25	279	160	82	244	73.3	11.5	4 rank	120	40.1
30	207	88	268	142	86	248	76.7	10.4	4 30	104	42.3
35	200	90 rank	261	129	90	254	80.0	10.0	5	93	44.6
40	194	90 40	154	118	92	259	83.3	9.3	6 rank	84	47.1
45	189	92	248	112	94 rank	263	86.7	8.8	6 45	75	49.6
50	184	94 rank	242	105	94 50	267	90.0 rank	8.3	7	70	52.6
55	178	94 55	236	99	96 rank	271	90.0 55	7.9	8 rank	65	55.6
60	174	96 rank	229	95	96 60	275	93.3	7.6	8 60	59	57.9
65	169	96 70	223	91	98 rank	279	96.7 rank	7.2	9	55	60.2
70	163	96	217	87	98 70	282	96.7 70	6.8	10 rank	52	62.2
75	160	98	211	83	100	285	100.0	6.5	10 75	46	64.1
80	153	98 rank	205	79	100	288	100.0	6.1	11	41	66.7
85	147	98 90	198	73	100 rank	291	100.0 rank	5.7	12 rank	36	69.7
90	141	98	188	67	100 100	298	100.0 100	5.3	12 90	32	74.6
95	130	100 rank 100	174	62	100	300	100.0	4.8	13 rank 100	23	81.0

TABLE 116

SCALE OF MENTAL MEASUREMENT

Girls — 17 Years

PERCENTILES	CANCELLATION		SUBSTITUTION			Memory Sum of 7–8–9	MUTILATED-TEXT		Instruction Box No. of Trials	Hard Opposites Acc. in Per Cent	CONSTRUCTION PUZZLES		Average Per. Rank
	Index	Accuracy	Index Pages 1–2	Index Page 3	Acc. Page 3		Time	Acc.			Chick Time	Boat Time	
5	244	76	348	286	54	198	503	21.9	Failure rank 5	10.0	300+ rank 5	300+ rank 5	23.4
10	215	80	314	244	70	215	495	31.3	Failure	17.5	300+	300+	28.3
15	200	84	295	202	76	227	487	40.6	Failure	22.5	300+	300+	32.8
20	194	86	280	165	80	235	475	46.9	3 rank 25	27.5	300+	300+	36.7
25	187	88	270	145	84	245	442	50.0	3	32.5	300+	300+	39.8
30	181	90	261	131	88	252	411	56.3	3	37.5	292	300+	43.2
35	176	92 rank 40	253	122	92	258	383	59.4	2 rank 45	40.0	254	300+	46.1
40	170	92	246	113	94 rank 45	263	356	65.6	2	45.0	226	287	48.4
45	165	94 rank 50	241	106	94	268	332	68.8	2	50.0	206	239	50.7
50	160	94	235	100	96 rank 55	273	312	71.9	2	52.5	176	203	53.0
55	156	96 rank 65	230	95	96	277	295	75.0 rank 60	2	57.5	159	176	55.0
60	151	96	224	89	98	280	281	75.0	1 rank 80	62.5	142	149	58.7
65	147	96	218	86	100 rank 100	283	263	81.3	1	67.5	126	127	61.5
70	143	98 rank 85	211	82	100	286	242	84.4	1	70.0	113	111	64.2
75	138	98	204	79	100	289	216	87.5	1	75.0	100	97	67.0
80	132	98	197	74	100	293	191	90.6	1	80.0	86	81	69.8
85	126	98	189	69	100	300 rank 100	169	93.8 rank 90	1	82.5	72	72	73.2
90	119	100 rank 100	180	64	100	300	147	93.8	1	87.5	60	58	76.8
95	108	100	167	57	100	300	119	100.0 rank 100	1	90 0	49	47	80.8

TABLE 117

SCALE OF MENTAL MEASUREMENT

Girls — 18 Years

Percentiles	Cancellation		Substitution			Memory Sum of 7-8-9	Mutilated Text		Easy Opposites	Hard Directions		Recognition	Freeman Box	Aussage	Construction Puzzles		Aver. Per. Rank
	Index	Accuracy	Index Pages 1-2	Index Page 3	Acc. Page 3		Time	Acc.		Time	No. Correct	Per Cent Correct	Time	Per Cent Correct	Time Cradle	Time Seal	
5	187	86	345	284	58	207	461	21.9	85.0	389	10	10	300+	26	300+	300+	28.3
10	171	92 rank	322	217	72	225	392	31.3	87.5	330	11	20 rank	300+	35	300+	300+	31.8
15	160	92 15	298	174	78	236	362	40.6	90.0	296	12	20 15	300+	41	300+	300+	35.8
20	155	94	279	149	84	247	335	43.8	92.5 rank	275	13	30	300+	45	300+	300+	39.5
25	150	96	269	133	88	254	301	50.0	92.5 25	258	14	30 rank	300+	48	300+	300+	42.6
30	145	96 rank	261	122	92	259	285	56.3	95.0 rank	245	15	30 30	300+ rank 5	51	300+	300+	45.3
35	140	96 40	254	114	96 rank	264	265	59.4	95.0 35	231	15 rank	40	300+	53	300+ rank 5	300+	46.0
40	135	96	247	107	96 40	268	246	62.5	97.5	222	15 40	40 rank	300+	56	300+	300+ rank 5	50.2
45	130	98	240	99	98	272	232	65.6	97.5 rank	215	16 rank	40 45	300+	59	300+	300+	52.1
50	125	98	233	95	98 rank	277	215	68.8	97.5 50	203	16 50	50	300+	62	300+	300+	54.1
55	120	98 rank	226	91	98 55	281	200	71.9	100.0	190	17 rank	50 rank	292	64	300+	300+	56.5
60	116	98 75	220	88	100	283	188	75.0	100.0	180	17 60	50 65	250	67	261	300+	59.3
65	113	98	214	85	100	285	175	78.1	100.0	172	18	50	203	69	219	300+	62.0
70	109	98	208	81	100	287	160	84.4	100.0	163	18 rank	60	199	71	202	280	64.9
75	105	98	203	78	100 rank	290	146	87.5	100.0 rank	149	18 75	60 rank	176	72	179	245	67.3
80	101	100	196	74	100 100	294	134	90.6	100.0 100	139	19	60 80	144	74	166	199	69.7
85	100	100 rank	188	71	100	300	120	93.8	100.0	130	19 rank	70 rank	118	76	137	163	72.5
90	100	100 100	180	65	100	300 rank	107	96.9	100.0	120	19 90	70 90	104	80	116	123	75.6
95	100	100	167	59	100	300 100	88	100	100.0	113	20 rank 100	80	83	85	91	94	81.5

table, all those above the seventieth percentile have scores of 100. According to the rule (see Chapter II) all of these individuals were given a percentile rank of the top of the group or 100. The exact percentile rank to be assigned to each score, in cases where the distribution is not perfect, is indicated in the tables by the number following the brackets.

The method of deriving and using the percentile scale was discussed in Chapter II. It may be well to remind the reader, however, that in each case the percentile of the scale marks the *upper* limit of a step. Thus in the case just discussed—that of accuracy of substitution, page 4, fourteen-year-old boys —all those having an accuracy of 60 or *less* are given a percentile rank of 5. All those having an accuracy of 70 but more than 60 (in this case scores of 70, 68, 66, 64, or 62) are given a percentile rank of 10, etc. The percentile rank of 100 is given to any score falling above the value of the ninety-fifth percentile. Thus in the case of the index of substitution, page 4, fourteen-year-old boys, all those having an index better than 65 are given a percentile rank of 100.

The five-percentile scales of average percentile ranks are given as the last item in the scale for each year.

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APPENDIX TO CHAPTER IV

DISTRIBUTION TABLES UPON WHICH THE PERCENTILE TABLES OF CHAPTER IV ARE BASED

TABLE 118 — DISTRIBUTIONS: CANCELLATIONS — INDEX

Boys

Seconds	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
80.1		6		2	9
100.1	5	37	7	9	62
120.1	19	110	49	30	90
140.1	53	129	104	81	82
160.1	98	125	134	105	50
180.1	125	96	118	89	38
200.1	125	78	81	47	15
220.1	104	51	56	41	8
240.1	79	22	31	22	1
260.1	65	6	17	28	1
280.1	45	7	10	7	1
300.1	32	2	7	11	
320.1	18		10		
340.1	22	7	5		
360.1	14				
380.1	12				
400.1	8				
420.1	19				
420+					
No. of Cases . . .	843	676	629	472	357

TABLE 119 — DISTRIBUTIONS: CANCELLATIONS — ACCURACY

Boys

Percents	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
100	187	361	239	239	262
95.5	130	151	150	107	64
90.5	169	100	125	77	20
85.5	85	33	46	24	7
80.5	89	17	38	11	2
75.5	55	5	18	8	2
70.5	35	5	11	6	
65.5	31	3	1	3	
60.5	21	3	4	2	1
55.5	14	3		1	
50.5	12		2		
45.5	11				
40.5	3				
35.5	3				
30.5	2				
25.5 –	2				
No. of Cases . . .	849	681	634	478	358

TABLE 120

DISTRIBUTIONS: CANCELLATIONS — INDEX

Girls

SECONDS	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
80.1–		19	3	6	53
100.1	12	74	31	35	70
120.1	38	135	87	67	56
140.1	81	125	112	92	56
160.1	89	84	100	76	24
180.1	100	51	71	64	9
200.1	78	21	56	26	4
220.1	75	9	30	12	3
240.1	49	6	18	11	1
260.1	37	3	11	4	
280.1	24	1		4	
300.1	25	1		2	
320.1	12		3		
340.1	9	3	2		
360.1	4				
380.1	4				
400.1	4				
420+	8				
No. of Cases	649	532	524	399	276

TABLE 121

DISTRIBUTIONS: CANCELLATIONS — ACCURACY

Girls

PERCENTS	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
100	113	305	212	181	210
95.5	117	107	110	94	44
90.5	113	75	103	65	11
85.5	76	18	36	24	5
80.5	87	12	29	21	4
75.5	42	6	19	9	2
70.5	21	3	15	3	
65.5	27	2	1	4	
60.5	21	3	1	3	
55.5	10	3	1		
50.5	14			2	
45.5	7		3		
40.5	4				
35.5	2				
30.5	1				
25.5–					
No. of Cases	655	534	530	406	276

TABLE 122

DISTRIBUTIONS: SUBSTITUTION — INDEX

Boys

Seconds	Practice Page 1					Seconds	Practice Page 2				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.		14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
						60–		1	2		
80–			2			60.1	22	57	61	54	42
80.1	1	22	50	38	29	80.1	105	167	201	139	111
100.1	54	106	159	123	103	100.1	190	177	155	148	108
120.1	138	182	179	147	100	120.1	216	142	125	88	59
140.1	178	147	143	97	78	140.1	119	78	60	33	30
160.1	157	113	54	43	36	160.1	62	27	17	15	11
180.1	108	59	30	23	10	180.1	39	14	9	4	8
200.1	68	23	8	11	6	200.1	12	7	2	1	1
220.1	28	12	5	1	5	220.1	7	6	2		
240.1	16	7	2	1		240.1					
260.1	6	4			1	260.1					
280.1	3	2			2	280.1					
300.1+	6					300+					
No. of Cases	763	677	632	484	370		772	676	634	482	370

Seconds	Practice		Memory Page 3			Seconds	Memory Page 4	
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.		14 yrs.	15 yrs.
60–	1		24	16	14	60–	8	21
60.1	77	127	140	103	93	60.1	118	165
80.1	190	202	146	126	77	80.1	210	169
100.1	229	174	107	76	55	100.1	145	124
120.1	139	93	39	44	40	120.1	79	42
140.1	69	44	43	32	25	140.1	58	44
160.1	42	15	24	17	10	160.1	28	23
180.1	12	11	19	14	18	180.1	26	11
200.1	4	11	19	8	9	200.1	19	13
220.1	3		11	9	7	220.1	11	13
240.1			6	8	1	240.1	13	16
260.1			4	2	4	260.1	12	3
280.1			7	8	4	280+	33	26
300+			29	17	13			
No. of Cases .	766	677	618	480	370		760	670

TABLE 123 — DISTRIBUTIONS: SUBSTITUTION — INDEX

Boys

Sum of Practice Pages

Seconds	14 yrs.	15 yrs.	Seconds	16 yrs.	Seconds	17 yrs.	18 yrs.
150– . . .			150–	26	150–	5	7
151			165	22	151	15	17
176			180	50	176	72	52
201			195	67	201	93	85
226		29	210	87	226	106	74
251	25	46	225	77	251	79	44
276	42	60	240	55	276	42	44
301	53	83	255	59	301	31	22
326	83	78	270	58	326	17	11
351	93	99	285	35	351	9	4
376	93	59	300	32	376	7	4
401	91	63	315	27	401	1	6
426	72	45	330	11	426		
451	57	34	345	8	451		
476	54	25	360	6	476		
501	24	16	375	3	501		
526	26	13	390	2	526		
551	18	2	405	7	551		
576	15	5			576		
600+ . . .	21	13			600		
No. of Cases	767	670		632		477	370

TABLE 124 — DISTRIBUTIONS: SUBSTITUTION — ACCURACY

Boys

Percents	Memory Page 4		Memory Page 3		
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
100	274	281	211	175	147
98	126	102	96	75	53
96	94	79	52	40	19
94			43	31	17
92	47	47	18	13	16
90			25	16	9
88	51	38	15	13	17
86			14	17	9
84	36	23	19	12	8
82			18	11	6
80	30	25	12	12	13
78			11	6	9
76	24	13	12	6	10
74			8	5	2
72	23	13	7	9	10
70			9	42	5
68	16	16	7		1
66			8		3
64	13	12	3		2
62			1		
60	6	5	3		1
58			5		1
56	9	23	2		13
54			4		
52–	21		19		
No. of Cases . .	770	677	622	483	371

TABLE 125

DISTRIBUTIONS: SUBSTITUTION — INDEX

Girls

Seconds	Practice Page 1					Seconds	Practice Page 2				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.		14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
						60–		5	3		
80–		2				60.1	17	39	45	45	35
80.1	6	16	43	49	27	80.1	97	123	154	119	100
100.1	46	88	125	90	72	100.1	164	174	154	120	73
120.1	121	165	172	123	92	120.1	141	106	91	63	29
140.1	152	122	101	72	39	140.1	112	48	50	28	22
160.1	136	76	50	36	22	160.1	58	22	18	13	10
180.1	74	34	20	14	15	180.1	21	13	11	7	7
200.1	38	21	13	15	6	200.1	5	3	5	6	
220.1	22	8	5	2	3	220.1	9	4	3		
240.1	16	4	3		1	240.1					2
260.1	1	1				260.1					
280.1	6	1				280.1					
300+	3					300+					
No. of Cases	621	538	532	401	277		624	537	534	401	278

Seconds	Practice		Memory Page 3			Memory Page 4		
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	Seconds	14 yrs.	15 yrs.
60–	1		19	31	15	60–	7	30
60.1	69	99	91	80	62	60.1	102	124
80.1	143	164	131	93	78	80.1	146	132
100.1	177	137	81	56	35	100.1	126	85
120.1	122	82	42	38	23	120.1	68	57
140.1	63	36	29	22	14	140.1	51	34
160.1	33	9	25	16	11	160.1	29	19
180.1	6	6	22	7	7	180.1	15	10
200.1	1	4	21	11	4	200.1	22	9
220.1	6		9	9	5	220.1	5	6
240.1			10	5	4	240.1	11	11
260.1			9	8	4	260.1	4	8
280.1			4	8	1	280+	36	13
300+			31	20	13			
No. of Cases .	621	537	524	404	276		622	538

TABLE 126 — DISTRIBUTIONS: SUBSTITUTION — INDEX

Girls

SUM OF PRACTICE PAGES

SECONDS	14 yrs.	15 yrs.	SECONDS	16 yrs.	SECONDS	17 yrs.	18 yrs.
150– . . .			150–	14	150–	6	2
151			165	22	151	21	17
176			180	33	176	60	44
201			195	59	201	74	60
226		22	210	67	226	93	50
251	27	35	225	62	251	57	46
276	35	52	240	67	276	34	18
301	51	60	255	55	301	23	14
326	59	87	270	34	326	11	15
351	68	64	285	32	351	5	
376	86	62	300	24	376	7	5
401	76	48	315	19	401	7	6
426	53	30	330	11	426+		
451	45	20	345	11			
476	34	12	360	2			
501	25	10	375	8			
526	20	4	390	4			
551	12	6	405+	8			
576	11	6					
600+ . . .	20	12					
No. of Cases	622	530		532		398	277

TABLE 127—DISTRIBUTIONS: SUBSTITUTION—ACCURACY IN PERCENTS

Girls

PERCENTS	MEMORY PAGE 4		MEMORY PAGE 3		
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
100	249	230	155	145	89
98	80	89	82	53	54
96	79	56	43	36	32
94			31	23	11
92	47	40	25	13	10
90			22	11	7
88	45	24	8	8	7
86			12	10	7
84	26	28	18	12	4
82			10	11	6
80	27	17	11	14	4
78			15	6	9
76	18	11	8	4	3
74			14	11	4
72	11	9	3	1	4
70			6	7	1
68	7	7	5		3
66			6	3	3
64	7	5	6	5	4
62			6	1	1
60	10	4	4		
58			4	6	
56	6	19	2		15
54			20	8	
52–	14		9	13	
No. of Cases . . .	626	539	525	401	278

TABLE 128

DISTRIBUTIONS: MEMORY — PER CENT CORRECT

Boys

7-Place Series

Percents	14 yrs.	15 yrs.	17 yrs.	Percents	16 yrs.	18 yrs.
100	283	335	264	100	398	213
95.5	194	134	105	92.9	115	78
90.5	146	88	43	89.3	18	7
85.5	33	18	10	85.7	38	25
80.5	54	31	23	82.2	14	10
75.5	60	28	22	78.6	18	11
70.5	12	8	4	75.0	6	5
65.5	23	17	5	71.4	12	3
60.5	7	8	2	67.9	2	4
55.5	12	2	1	64.3	2	2
50.5	15	2	1	60.7	3	3
45.5	4		2	57.1	1	2
40.5–.	2			53.6		
				50.0– . . .	3	2
No. of Cases . . .	845	671	482		630	365

TABLE 128—*Continued*

8-Place Series

Percents	14 yrs.	15 yrs.	17 yrs.	Percents	16 yrs.	18 yrs.
100	136	151	182	100	226	154
95.5	116	101	94	93.8	108	59
90.5	63	65	48	90.6	17	6
85.5	91	62	49	87.5	64	36
80.5	42	39	13	84.4	26	15
75.5	107	88	28	81.3	39	12
70.5	88	57	24	78.1	26	15
65.5	41	20	8	75.0	27	16
60.5	68	37	20	71.9	16	7
55.5	19	14	4	68.6	18	11
50.5	41	17	5	65.5	12	11
45.5	14	6	7	62.5	8	4
40.5–	20	12		59.4	26	9
				50.3– . . .	19	10
No. of Cases . . .	846	669	482		632	365

TABLE 128—*Continued*

9-Place Series

Percents	14 yrs.	15 yrs.	17 yrs.	Percents	16 yrs.	18 yrs.
100	50	57	96	100	65	65
95.5	60	58	55	94.4	83	39
90.5	60	61	76	91.7	13	7
85.5	72	72	36	88.9	54	40
80.5	42	28	46	86.1	26	13
75.5	108	78	39	83.3	38	26
70.5	92	72	30	80.6	33	22
65.5	101	62	32	77.8	42	22
60.5	88	65	21	75.0	27	11
55.5	39	27	15	72.2	35	18
50.5	53	45	13	69.4	37	11
45.5	38	25	8	66.7	34	13
40.5	18	19	4	63.9	28	9
35.5	14	2	3	61.1	20	13
30.5−	11		7	58.3	24	9
				55.6	12	9
				52.8	13	11
				50.0	12	7
				47.2	12	3
				44.4	8	5
				41.6	5	3
				38.8−	11	8
No. of Cases	846	671	481		632	364

TABLE 129

DISTRIBUTIONS: MEMORY — SUM OF 7-, 8-, AND 9-PLACE SERIES

Boys

Sum of Percents	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs
300	24	33	41	67	50
299	35	34	62	38	39
289	57	60	105	73	53
279	48	62	77	61	43
269	69	72	77	42	36
259	76	68	58	39	30
249	88	73	59	37	26
239	85	62	35	29	28
229	77	61	33	21	16
219	69	34	35	22	13
209	54	32	21	17	8
199	52	24	5	10	8
189	32	18	8	10	4
179	29	13	5	3	3
169	17	10	3	1	2
159−	32	14	4	4	4
No. of Cases	844	670	628	474	363

TABLE 130

DISTRIBUTIONS: MEMORY — PER CENT CORRECT

Girls

7-Place Series

Percents	14 yrs.	15 yrs.	17 yrs.	Percents	16 yrs.	18 yrs.
100	241	290	249	100	350	182
95.5	144	88	64	92.9	97	51
90.5	98	70	34	89.3	12	2
85.5	22	15	13	85.7	32	14
80.5	45	27	17	82.2	10	3
75.5	44	20	20	78.6 . . .	17	5
70.5	21	6	3	75.0	2	5
65.5	17	9	6	71.4	2	8
60.5	7	3	2	67.9	4	4
55.5	2	2		64.3	3	2
50.5	9			60.7	2	
45.5	3			57.1	1	2
40.5–	1			53.6	2	
				50.0– . . .	1	
No. of Cases . . .	654	530	408		535	278

TABLE 130—*Continued*

8-Place Series

Percents	14 yrs.	15 yrs.	17 yrs.	Percents	16 yrs.	18 yrs.
100	107	131	144	100	196	134
95.5	99	81	95	93.8	89	42
90.5	56	54	43	90.6	17	4
85.5	71	47	35	87.5	54	26
80.5	30	30	14	84.4	26	5
75.5	88	57	29	81.3	31	20
70.5	59	47	22	78.1	16	5
65.5	24	14	7	75.0	19	13
60.5	41	29	11	71.9	15	7
55.5	18	12		68.8	13	6
50.5	31	14	3	65.6	10	5
45.5	17	8	4	62.5	12	1
40.5–	14	6	1	59.4	24	7
				50.3–	13	4
No. of Cases . . .	655	530	408		535	279

TABLE 130—*Continued*

9-Place Series

Percents	14 yrs.	15 yrs.	17 yrs.	Percents	16 yrs.	18 yrs.
100	41	37	77	100	61	58
95.5	59	54	73	94.4	54	31
90.5	58	45	47	91.7	12	7
85.5	63	62	44	88.9	49	36
80.5	43	40	20	86.1	25	16
75.5	78	52	36	83.3	39	23
70.5	64	47	31	80.6	29	11
65.5	66	61	24	77.8	44	15
60.5	55	47	22	75.0	26	14
55.5	24	18	6	72.2	37	13
50.5	36	30	12	69.4	31	7
45.5	34	12	9	66.7	14	9
40.5	12	20	3	63.9	17	8
35.5	10	4		61.1	9	7
30.5–	10		4	58.3	16	9
				55.6	16	2
				52.8	14	3
				50.0	8	3
				47.2	9	1
				44.4	9	4
				41.6	4	2
				38.8–	12	
No. of Cases	653	529	408		535	279

TABLE 131

DISTRIBUTIONS: MEMORY — SUM OF 7-, 8-, AND 9-PLACE SERIES

Girls

Sum of Percents	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
300	20	27	42	53	40
299	26	23	43	37	28
289	53	66	92	74	62
279	45	43	67	51	31
269	62	68	69	40	32
259	64	46	47	34	27
249	70	44	56	28	12
239	52	48	30	20	12
229	60	34	29	18	13
219	50	46	17	14	7
209	45	31	14	12	3
199	31	17	9	10	5
189	20	13	2	6	3
179	17	7	5	2	
169	10	8	2	3	3
159–	27	8	4	1	1
No. of Cases	652	529	528	403	279

TABLE 132 — DISTRIBUTIONS: SENTENCES — INDEX OF IDEAS

Boys

Seconds	14 yrs.	15 yrs.	Seconds	16 yrs.
5–	6	11	4–	4
6.5	54	93	4–5.49	45
6.6	180	179	5.5	69
8.6	190	134	6.5	161
10.6	128	79	8.5	122
12.6	104	53	10.5	78
14.6	55	33	12.5	49
16.6	37	16	14.5	36
18.6	15	16	16.5	12
20.6	23	20	18.5	16
24.6	15	6	20.5	10
28.6	8	5	22.5	7
32.5+	10	5	24.5	2
			28+	14
No. of Cases	825	650		625

TABLE 133 — DISTRIBUTION: SENTENCES — NUMBER BEGUN IN TWO SECONDS OR LESS

Boys

Number	14 yrs.	15 yrs.	Number	16 yrs.
0	48	46	0–1	93
1	50	34	2	94
2	168	82	4	102
4	131	73	6	90
6	145	100	8	70
8	127	113	10	86
10	99	118	12	86
12–	69	92		
No. of Cases	837	658		621

TABLE 134 — DISTRIBUTIONS: SENTENCES — NUMBER CORRECT

Boys

Number	14 yrs.	15 yrs.	16 yrs.
7–	6	4	4
7	21	4	2
8	28	12	13
9	66	19	32
10	76	37	33
11	110	67	57
12	186	136	132
13	354	378	354
No. of Cases	847	657	627

TABLE 135

DISTRIBUTIONS: SENTENCES — NUMBER OF IDEAS

Boys

Number	14 yrs.	15 yrs.	16 yrs.
12–	41	23	11
12	34		11
13	78	87	36
15	92		53
17	87	124	61
19	81		52
21	78	162	58
23	89		66
25	62	112	65
27	44		55
29	55	71	45
31	31		34
33	25	46	26
35	12		15
37	13	31	11
39	3		6
41	8		5
43	4		4
44+	11		13
No. of Cases	848	656	627

TABLE 136

DISTRIBUTIONS: SENTENCES — INDEX OF IDEAS

Girls

Seconds	14 yrs.	15 yrs.	Seconds	16 yrs.
5–	4	12	4–	8
5	49	86	4–5.49	53
6.6	150	136	5.5	71
8.6	131	104	6.5	134
10.6	106	55	8.5	100
12.6	68	30	10.5	48
14.6	41	28	12.5	30
16.6	39	19	14.5	22
18.6	16	10	16.5	16
20.6	17	14	18.5	9
24.6	5	4	20.5	7
28.6	7	7	22.5	4
32.5+	6	4	24.5	2
			26.5	1
			28+	8
No. of Cases	639	509		513

TABLE 137

DISTRIBUTIONS: SENTENCES — NUMBER BEGUN IN TWO SECONDS OR LESS

Girls

Number	14 yrs.	15 yrs.	Number	16 yrs.
0	42	40	0–1	73
1	51	46	2	75
2	100	78	4	73
4	112	56	6	80
6	113	89	8	67
8	109	73	10	91
10	76	58	12	63
12–13	53	73		
No. of Cases	656	513		522

TABLE 138

DISTRIBUTIONS: SENTENCES — NUMBER CORRECT

Girls

Number	14 yrs.	15 yrs.	16 yrs.
7–	5	3	2
7	9	4	4
8	33	13	5
9	41	18	13
10	56	27	29
11	81	44	33
12	177	109	101
13	254	299	337
No. of Cases	656	517	524

TABLE 139 — DISTRIBUTIONS: SENTENCES — NUMBER OF IDEAS

Girls

Number	14 yrs.	15 yrs.	16 yrs.
12−	31	13	5
12	26		8
13	39	63	13
15	66		32
17	65	110	33
19	83		49
21	68	114	55
23	46		60
25	59	97	47
27	57		52
29	33	57	47
31	29		28
33	20	25	30
35	10		22
37	7	26	13
39	5		10
41	4		3
43	2		5
44+	7		13
No. of Cases	657	505	525

TABLE 140 — DISTRIBUTIONS: MUTILATED TEXT — TIME

Boys

Seconds	17 yrs.	18 yrs.
54−		1
55–79	1	2
80	8	19
105	14	23
130	16	21
155	27	29
180	29	29
205	39	22
230	30	23
255	28	24
280	34	19
305	31	21
330	18	18
355	28	12
380	22	13
405	25	6
430	19	5
455	14	3
480	76	30
480+	24	
No. of Cases	483	320

TABLE 141 — DISTRIBUTIONS: MUTILATED TEXT — ACCURACY

Boys

Percents	17 yrs.	18 yrs.
100–95.6	28	15
95.5	48	12
90.5	17	10
85.5	42	29
80.5	15	13
75.5	46	31
70.5	35	28
65.5	14	20
60.5	42	35
55.5	20	11
50.5	37	29
45.5	32	33
40.5	13	10
35.5	33	10
30.5	13	2
25.5	18	14
20.5	18	9
15.5	15	6
10.5		2
5.5 and 5.5–		4
No. of Cases	486	323

TABLE 142 — DISTRIBUTIONS: MUTILATED TEXT — TIME

Girls

Seconds	17 yrs.	18 yrs.
54–		
55–79	3	6
80	9	13
105	15	19
130	21	21
155	24	17
180	22	22
205	19	15
230	21	18
255	28	11
280	36	17
305	25	6
330	22	9
355	19	11
380	18	6
405	17	6
430	16	1
455	15	2
480	65	9
480+	14	
No. of Cases	409	209

TABLE 143 — DISTRIBUTIONS: MUTILATED TEXT — ACCURACY

Girls

Percents	17 yrs.	18 yrs.
100–95.6	30	26
95.5	49	22
90.5	26	9
85.5	45	20
80.5	17	9
75.5	46	21
70.5	34	24
65.5	12	11
60.5	30	20
55.5	16	6
50.5	23	10
45.5	18	15
40.5	8	3
35.5	18	10
30.5	6	5
25.5	14	5
20.5	6	3
15.5	12	2
10.5		2
5.5–		
No. of Cases	410	225

TABLE 144 — DISTRIBUTIONS: OPPOSITES

Boys

Corrected Percents	14 yrs. Easy	15 yrs. Easy	Percents	17 yrs. Hard	18 yrs. Easy	18 yrs. Hard
180	4	130	100	7	132	6
130.5	43	170	95	15	82	6
110.5	145	111	90	19	45	13
100.5	122	118	85	20	30	14
95.5	92		80	23	15	11
90.5	89	50	75	28	6	16
85.5	52		70	27	2	5
80.5	34	25	65	40	15	6
75.5	25		60	28		10
70.5	10	9	55	30		10
65.5	21		50	35		6
60.5	12	6	45	41		7
55.5	8		40	27		4
50.5	3	5	35	37		4
45.5	5		30	24		3
40.5	2	2	25	24		4
35.5	4		20	19		2
30.5		1	15	14		3
25.5–	4		10	8		6
			5	17		
No. of Cases	675	627		483	327	136

TABLE 145 — DISTRIBUTIONS: OPPOSITES

Girls

Corrected Percents	14 yrs. Easy	15 yrs. Easy	Percents	17 yrs. Hard	18 yrs. Easy	18 yrs. Hard
180	8	125	100	6	112	12
130.5	69	136	95	15	58	12
110.5	92	109	90	29	29	16
100.5	110	74	85	26	21	16
95.5	74		80	25	4	13
90.5	61	31	75	24	4	10
85.5	48		70	28	4	13
80.5	33	13	65	22	5	9
75.5	19		60	19		9
70.5	8	9	55	25		8
65.5	10		50	27		8
60.5	9	3	45	25		3
55.5	5		40	23		5
50.5	3	6	35	16		7
45.5	5		30	23		5
40.5		3	25	20		2
35.5	2		20	26		3
30.5	2	2	15	8		
25.5–	2		10	9		2
			5	11		
No. of Cases	560	511		407	237	153

TABLE 146
DISTRIBUTIONS: CAUSE AND EFFECT — PER CENT CORRECT

Boys — 16 years

Percents	
100	115
99.9–97.6	42
96.6	76
93.2	34
89.9	46
86.6	26
83.2	58
79.9	19
76.6	31
73.2	14
69.9	30
66.6	13
63.2	13
59.9	11
56.6	12
53.2	5
49.9	14
46.6	8
43.2	6
39.9	4
36.6	15
33.2	1
29.9–	13
No. of Cases	606

TABLE 147
DISTRIBUTIONS: CAUSE AND EFFECT — PER CENT CORRECT

Girls — 16 years

Percents	
100	136
99.9–97.6	23
96.6	56
93.2	38
89.9	52
86.6	21
83.2	33
79.9	20
76.6	23
73.2	12
69.9	19
66.6	4
63.2	14
59.9	14
56.6	21
53.2	5
49.9	8
46.6	2
43.2	11
39.9	2
36.6	4
33.2	5
29.9–	11
No. of Cases	534

TABLE 148

DISTRIBUTIONS: CONSTRUCTION PUZZLES — TIME OF SOLUTION

Boys

Seconds	Egg 16 yrs.	Flower Pot 16 yrs.	Seconds	Chick 17 yrs.	Boat 17 yrs.	Seconds	Cradle 18 yrs.	Seal 18 yrs.
0–20		3	30–	1	2	30–	3	3
21–30	1	46	30.1	24	24	45	8	
31	11	143	45.1	31	31	60	13	3
46	13	118	60.1	45	29	75	14	4
61	8	85	75.1	36	27	90	17	3
76	11	52	90.1	27	23	105	20	10
91	12	36	105.1	25	25	120	10	5
106	4	25	120.1	38	28	135	13	11
121	28	28	150.1	31	23	150	14	9
151	14	19	180.1	24	27	165	8	9
181	28	12	210.1	20	15	180	10	6
211	14	8	240.1	18	16	195	10	9
241	20	5	270.1	14	17	210	5	7
271	20	3	300+	138	132	225	7	9
300+	364	18				240	8	6
						255	6	9
						270	9	2
						285	11	9
						300+	173	216
No. of Cases	548	601		472	419		359	330

TABLE 149

DISTRIBUTIONS: CONSTRUCTION PUZZLES — TIME OF SOLUTION

Girls

Seconds	Egg 16 yrs.	Flower Pot 16 yrs.	Seconds	Chick 17 yrs.	Boat 17 yrs.	Seconds	Cradle 18 yrs.	Seal 18 yrs.
0–20		1	30–	1	1	45–	7	1
21	2	41	30.1	11	13	60	12	4
31	9	74	45.1	27	24	75	10	5
46	6	84	60.1	26	17	90	8	5
61	9	70	75.1	19	24	105	14	7
76	3	44	90.1	22	15	120	14	5
91	5	32	105.1	26	21	135	5	4
106	10	23	120.1	36	23	150	20	4
121	11	40	150.1	35	19	165	8	6
151	8	22	180.1	18	19	180	19	3
181	12	15	210.1	32	13	195	12	6
211	17	10	240.1	11	11	210	6	3
241	15	6	270.1	19	10	225	3	1
271	13	5	300+	114	133	240	11	9
300+	302	25				255	8	5
						270	3	1
						285		7
						300+	163	153
No. of Cases	422	492		397	343		323	229

TABLE 150

DISTRIBUTIONS: HEALY AND FERNALD PUZZLE BOX — TIME OF OPENING

Boys

Seconds	15 yrs.	Seconds	16 yrs.
100–	49	50–	7
100	196	51	48
201	135	76	94
301	88	101	72
401	35	126	66
501	25	151	56
600+	102	176	52
		201	38
		226	26
		251	23
		276	18
		301	22
		351	12
		401	15
		501	9
		601	4
		720+	21
No. of Cases	630		583

TABLE 151

DISTRIBUTIONS: HEALY AND FERNALD PUZZLE BOX — TIME OF OPENING

Girls

Seconds	15 yrs.	Seconds	16 yrs.
100–	11	50–	2
100	68	51	16
201	84	76	25
301	70	101	39
401	56	126	40
501	33	151	33
600+	184	176	36
		201	35
		226	24
		251	19
		276	18
		301	21
		351	22
		401	21
		501	10
		601	9
		720+	43
No. of Cases	506		413

TABLE 152

DISTRIBUTIONS: HAYES INSTRUCTION BOX — NUMBER OF TRIALS FOR SUCCESSFUL PERFORMANCE

Boys — 17 years

No. of Trials	
1	199
2	167
3	63
Failure	35
No. of Cases	464

TABLE 153

DISTRIBUTIONS: HAYES INSTRUCTION BOX — NUMBER OF TRIALS FOR SUCCESSFUL PERFORMANCE

Girls — 17 years

No. of Trials	
1	153
2	97
3	58
Failure	53
No. of Cases	361

TABLE 154

DISTRIBUTIONS: FREEMAN PUZZLE BOX — TIME OF OPENING

Boys — 18 years

Seconds	
20	
30.1	5
40.1	8
50.1	5
60.1	14
70.1	14
80.1	19
90.1	11
100.1	18
110.1	15
120.1	9
130.1	11
140.1	8
150.1	10
160.1	11
170.1	13
180.1	6
190.1	3
200.1	9
210.1	3
220.1	5
230.1	9
240.1	1
250.1	3
260.1	8
270.1	2
280.1	4
290.1	3
300+	190
No. of Cases	336

TABLE 155

DISTRIBUTIONS: FREEMAN PUZZLE BOX — TIME OF OPENING

Girls — 18 years

Seconds	
20	3
30.1	
40.1	1
50.1	
60.1	4
70.1	2
80.1	5
90.1	6
100.1	5
110.1	11
120.1	1
130.1	7
140.1	4
150.1	2
160.1	4
170.1	5
180.1	3
190.1	7
200.1	4
210.1	2
220.1	5
230.1	7
240.1	5
250.1	3
260.1	1
270.1	2
280.1	4
290.1	6
300+	123
No. of Cases	232

TABLE 156

DISTRIBUTIONS: RECOGNITION

Boys — 18 Years

No. of Errors	+ Errors	— Errors	Per Cent Correct	
10			100	1
9			90	14
8	3		80	28
7	6		70	54
6	21	2	60	71
5	38	4	50	85
4	76	18	40	52
3	83	43	30	27
2	71	93	20	12
1	47	127	10	10
0	13	71	0	2
—			—	2
No. of Cases . . .	358	358		358

TABLE 157

DISTRIBUTIONS: RECOGNITION

Girls — 18 Years

No. of Errors	+ Errors	— Errors	Per Cent Correct	
10	3	1	100	
9	1	1	90	3
8	1		80	30
7	9		70	34
6	28	2	60	59
5	41	3	50	45
4	55	12	40	35
3	53	34	30	40
2	50	63	20	19
1	27	96	10	7
0—	9	65	0	2
—			—	3
No. of Cases . . .	277	277		277

TABLE 158

DISTRIBUTIONS: AUSSAGE — PER CENT CORRECT IDEAS

Boys — 18 Years

Percents	
100–96	1
95–91	3
90	8
85	17
80	27
75	26
70	54
65	59
60	50
55	32
50	22
45	28
40	8
35	5
30	6
25	4
20	4
15	
10	
5	1
No. of Cases	355

TABLE 159

DISTRIBUTIONS: AUSSAGE — PER CENT CORRECT IDEAS

Girls — 18 Years

Percents	
100–96	3
95–91	6
90	17
85	16
80	38
75	35
70	28
65	22
60	27
55	26
50	17
45	14
40	10
35	5
30	9
25	2
20	
15	2
10	1
5	
No. of Cases	278

TABLE 160 — DISTRIBUTIONS: HARD DIRECTIONS

Boys — 18 Years

Seconds		Number Correct	
106–120	19	20	25
121–135	13	19	34
136	22	18	46
151	22	17	34
166	24	16	36
181	24	15	37
196	25	14	23
211	22	13	27
226	20	12	18
241	26	11	21
256	22	10	17
271	15	9	15
286	14	8	9
301	36	7–	17
361	23		
421	18		
481	6		
541+	7		
No. of Cases	358		359

TABLE 161

DISTRIBUTIONS: HARD DIRECTIONS

Girls — 18 Years

Seconds		Number Correct	
106–120	29	20	44
121–135	21	19	35
136	21	18	38
151	14	17	29
166	27	16	32
181	20	15	32
196	11	14	16
211	30	13	12
226	15	12	10
241	16	11	12
256	13	10	7
271	8	9	3
286	12	8	5
301	20	7–	2
361	7		
421	4		
481	3		
541 plus	3		
No. of Cases	274		277

TABLE 162

DISTRIBUTIONS: YERKES POINT SCALE

Boys — 18 Years

Point Score	
100–96	17
95–91	26
90–86	30
85–81	47
80–76	29
75–71	30
70–66	15
65–61	7
60–56	7
55–51	
50–46	
No. Tested	208
Omitted	165
No. of Cases	373

TABLE 163

DISTRIBUTIONS: YERKES POINT SCALE

Girls — 18 Years

Point Score	
100–96	12
95–91	34
90–86	27
85–81	25
80–76	18
75–71	16
70–66	8
65–61	8
60–56	5
55–51	1
50–46	3
No. Tested	157
Omitted	133
No. of Cases	290

TABLE 164

DISTRIBUTIONS: MENTAL TESTS — AVERAGE PERCENTILE RANKS

Boys

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10–	2				
11	6	3	5	1	
16	14	11	7	3	4
21	31	18	18	11	6
26	40	23	33	23	15
31	53	64	40	39	15
36	63	62	53	39	29
41	78	62	61	52	37
46	92	68	68	46	36
51	92	79	79	50	35
56	86	81	60	42	42
61	91	60	57	42	35
66	82	47	54	56	31
71	66	43	44	29	37
76	28	34	35	27	23
81	34	22	13	16	20
86	13	7	8	8	4
91		1	2	3	1
No. of Cases . . .	871	685	637	487	370

TABLE 165

DISTRIBUTIONS: MENTAL TESTS — AVERAGE PERCENTILE RANKS

Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10–	3				
11	3	4	4		
16	11	10	10	11	3
21	18	13	21	14	5
26	23	25	20	24	14
31	40	34	42	22	18
36	59	40	36	32	18
41	60	64	59	30	26
46	61	67	53	44	29
51	77	56	43	44	36
56	67	51	57	32	26
61	69	63	68	38	25
66	60	41	44	36	30
71	54	30	27	30	25
76	32	30	22	27	14
81	19	9	12	17	6
86	7	4	16	5	8
91	1	1	1	1	1
96					1
No. of Cases . . .	664	542	535	407	285

CHAPTER V

COMPARISON OF WORKING AND SCHOOL CHILDREN

The comparison of the working and school group will be based upon the ten-percentile scales for the two groups. We shall first discuss the comparison of working and school children in each measurement made, and then summarize the comparison in physical and in mental measurements. In the tables the X series is school children and the M series working children.

SECTION I: PHYSICAL MEASUREMENTS

Height

The ten-percentile scales of height for boys at each of the five ages are presented in Table 166.

To facilitate comparison, the differences between the two groups have been arranged separately (Table 167). The table shows a marked superiority in height of school boys over working boys. The median difference at fourteen years is three centimeters. The school boys were about three months older than the working boys, but since the gain in height for the whole group is 6.8 centimeters in the year from fourteen to fifteen, only one centimeter could be attributed to the difference in age. The difference in favor of the school boys is marked at fourteen (median 3 cm.) and is still greater at fifteen years (median 5.8).

From fifteen years on, the median difference decreases to 3.9 at sixteen years, 2.0 at seventeen years, and 1.4 at eighteen years. At sixteen years, the results were modified by the introduction of a large new group of school children of superior social status (see Chapter II, p. 10 ff.). The new group increased the contrast between working and school children particularly in the lower ranges of the scale. However, in spite of this additional advantage given the school boys at sixteen years, the difference between the two groups is less at seventeen years than at fourteen or fifteen, and is least of all at eighteen years. The school boys retain at eighteen an advantage in height of a centimeter and a half, but the working boys gain on them steadily between fifteen and eighteen years. In every year the difference in favor of the school boys is materially greater in the upper than in the lower ranges of the scale. In other words, there is more difference between tall school boys and tall working boys than there is between short school boys and short working boys. The interpretation which seems necessary is that in the working group we had a set of boys who reached maturity later than school boys. The period of most rapid growth was

TABLE 166

HEIGHT IN CENTIMETERS

Boys

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	130.6	139.3	141.6	155.6	157.9	131.0	135.0	139.0	148.5	151.8
10	144.2	150.0	158.6	162.8	165.0	142.6	148.5	154.2	161.0	162.7
20	147.8	154.8	161.7	165.3	167.7	145.3	151.6	157.5	163.9	165.4
30	150.0	157.0	164.3	167.3	169.1	147.4	154.1	160.0	165.5	167.6
40	152.2	159.7	166.2	169.1	170.5	149.3	156.3	161.9	167.2	169.1
50	154.3	162.1	167.7	170.8	172.0	151.3	158.3	163.8	168.8	170.6
60	156.5	164.3	170.0	172.6	174.2	153.3	159.6	165.6	170.4	172.2
70	158.7	166.4	172.0	174.3	176.4	155.2	162.3	167.4	172.1	173.9
80	161.5	169.1	174.1	176.3	178.8	158.2	164.9	169.6	174.1	175.6
90	166.5	172.8	177.6	179.2	182.2	161.8	168.6	172.1	176.6	178.4
U. L.	178.3	180.3	185.6	187.6	186.5	171.0	178.3	185.6	191.5	187.0
No. of Cases .	427	291	285	175	59	423	391	345	310	294
Median	154.3± .34 P. E.	162.1± .44 P. E.	167.7± .38 P. E.	170.8± .42 P. E.	172.0± .74 P. E.	151.3± .31 P. E.	158.3± .34 P. E.	163.8± .33 P. E.	168.8± .29 P. E.	170.6± .30 P. E.
Q	5.6	6.0	5.1	4.5	4.6	5.2	5.4	4.9	4.2	4.2

TABLE 167

HEIGHT: DIFFERENCES IN CENTIMETERS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	1.6	1.5	4.4	1.8	2.3
20	2.5	3.2	4.2	1.4	2.3
30	2.6	2.9	4.3	1.8	1.5
40	2.9	3.4	4.3	1.9	1.4
50	3.0	3.8	3.9	2.0	1.4
60	3.2	4.7	4.4	2.2	2.0
70	3.5	4.1	4.6	2.2	2.5
80	3.3	4.2	4.5	2.2	3.2
90	4.7	4.2	5.5	2.6	3.8

TABLE 168

HEIGHT IN CENTIMETERS

Girls

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	134.0	141.0	143.6	139.3	146.2	137.2	142.0	144.0	144.4	145.0
10	147.6	150.4	152.6	154.2	153.6	146.3	149.9	151.8	153.0	153.6
20	149.5	152.7	155.7	156.6	157.0	149.3	151.5	154.3	155.7	156.1
30	151.5	154.4	156.9	158.1	159.2	151.6	154.5	156.3	157.3	157.9
40	153.1	156.0	158.4	159.6	160.5	153.3	156.2	158.0	158.9	159.6
50	154.3	157.5	159.9	161.1	161.6	155.0	157.5	159.6	160.5	161.1
60	156.5	159.1	161.1	162.5	162.7	156.6	158.8	161.3	162.1	162.6
70	158.2	160.9	162.7	164.1	164.1	158.3	160.5	162.5	163.7	164.3
80	159.9	163.0	164.9	166.1	166.1	160.1	162.7	164.4	165.7	166.3
90	162.4	165.6	167.2	168.8	168.8	162.8	165.6	167.0	167.6	169.0
U. L.	175.0	176.9	179.5	176.9	176.6	170.0	174.7	174.5	176.7	174.5
No. of Cases .	332	251	236	160	61	330	285	288	239	171
Median	154.3± .30 P. E.	157.5± .31 P. E.	159.9± .31 P. E.	161.1± .38 P. E.	161.6± .56 P. E.	155.0± .30 P. E.	157.5± .32 P. E.	159.6± .30 P. E.	160.5± .33 P. E.	161.1± .39 P. E.
Q	4.3	4.2	3.8	3.9	3.5	4.4	4.3	4.1	4.1	4.2

TABLE 169

HEIGHT: DIFFERENCES IN CENTIMETERS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls

PERCENTILES	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	1.3	.5	1.8	1.2	0.0
20	.2	1.2	1.4	.9	.9
30	− .1	− .1	.6	.8	1.3
40	− .2	− .2	.4	.7	.9
50	− .7	.0	.3	.6	.5
60	− .1	.3	− .2	.4	.1
70	− .1	.4	.2	.4	− .2
80	− .2	.3	.5	.4	− .2
90	− .4	.0	.2	1.2	− .2

complete for the school boys at sixteen years, while in the case of the working boys it continued up to seventeen years. This conclusion finds its confirmation in Chapter VI, in which the growth of working and school boys from year to year is shown. Since the difference existed at fourteen years, when both groups were still school children, and is less at eighteen years than it was at fourteen, these results offer no suggestion that growth in height was affected unfavorably by industrial life.

The tables of height for the girls present a very different appearance from those for the boys. Table 168 gives the ten-percentile tables of height for girls, and Table 169 the differences between the school (X) and working (M) girls. The differences at fourteen and at fifteen are too small and too irregular to be considered really significant. With the addition of the school group of sixteen years from a superior social status, the difference becomes somewhat more consistent in favor of the school girls.

Since the amount of yearly gain from fourteen to sixteen is between two and three centimeters for girls, a difference of from one-half to three-fourths of a centimeter can be attributed to the three months' difference in age between school and working girls. This advantage in age belongs to the school girls, but the advantage in height at fourteen belongs to the working girls. The importance of the difference thus is enhanced. It is perhaps fair to say, therefore, that at fourteen and fifteen years the working girls are slightly taller, but that there is no difference in height at years sixteen, seventeen, and eighteen. The gain of the school girls at sixteen may be due to the new group added at that age. The girls also differ from the boys in showing no contrast between the upper and the lower ranges of the scale of difference. There is as little difference between tall school girls and tall working girls as between short school girls and short working girls. The probable reasons for these and other sex differences in the relation of the two groups will be dealt with in the chapter on sex comparisons—Chapter VII.

WEIGHT

The percentile scales of weight for the boys at each of the five ages are presented in Table 170. The differences between the school series (X) and the working series (M) are presented in Table 171. The differences in weight are on the whole very similar to those in height. School boys are heavier than working boys at every age. The difference at fourteen, fifteen, and sixteen years is between three and four kilograms. As in the case of height, the working group gained rapidly on the school group in the year between sixteen and seventeen. The median difference at seventeen is only 1.8 kilograms in favor of the school boys. Between seventeen and eighteen, however, the school boys again gain in weight more rapidly than the working group, though they show no such advantage in height. As in

TABLE 170

WEIGHT IN KILOGRAMS

Boys

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	25.8	30.8	33.8	43.4	47.1	26.1	29.5	34.8	36.3	44.1
10	34.9	38.6	46.0	50.9	55.0	33.2	38.0	42.4	48.4	52.0
20	37.8	43.4	49.0	53.9	56.8	35.7	40.6	45.7	52.2	54.4
30	40.0	45.5	51.9	55.4	58.2	37.9	43.0	48.3	54.1	56.0
40	42.1	48.4	54.5	57.6	60.0	39.3	45.1	50.8	55.6	58.0
50	43.9	50.6	56.5	59.2	61.6	40.7	47.1	52.7	57.1	59.4
60	45.7	52.5	58.4	60.9	64.6	42.2	49.0	54.4	58.8	61.1
70	48.0	54.1	60.5	63.4	66.3	44.3	51.2	55.9	60.5	62.8
80	50.9	57.0	63.4	66.1	68.2	46.7	53.7	57.3	62.2	65.0
90	56.5	60.5	66.7	69.2	72.7	50.5	56.6	62.0	64.8	67.8
U. L.	79.1	83.5	91.1	99.4	89.8	66.1	68.5	75.0	71.3	76.1
No. of Cases . .	426	290	284	175	56	423	391	346	308	293
Median	43.9±.32 P. E.	50.6±.41 P. E.	56.5±.42 P. E.	59.2±.39 P. E.	61.6±.82 P. E.	40.7±.28 P. E.	47.1±.34 P. E.	52.7±.32 P. E.	57.4±.31 P. E.	59.4±.32 P. E.
Q	5.3	5.6	5.8	5.1	4.9	4.4	5.4	4.8	4.4	4.4

TABLE 171

WEIGHT: DIFFERENCES IN KILOGRAMS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

PERCENTILES	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	1.7	.6	3.6	2.5	3.0
20	2.1	2.8	3.3	1.7	2.4
30	2.1	2.5	3.6	1.3	2.2
40	2.8	3.3	3.7	2.0	2.0
50	3.2	3.5	3.8	2.1	2.2
60	3.5	3.5	4.0	2.1	3.5
70	3.7	2.9	4.6	2.9	3.5
80	4.2	3.3	6.1	3.9	3.2
90	6.0	5.9	4.7	4.4	4.9

TABLE 172

WEIGHT IN KILOGRAMS

Girls

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	26.7	35.0	39.1	41.2	40.3	29.5	34.9	36.4	38.0	42.0
10	37.3	40.4	43.1	46.3	44.4	36.1	40.6	43.3	45.7	46.0
20	40.1	43.3	46.5	48.1	46.9	39.1	43.6	46.1	47.9	47.8
30	42.4	45.4	48.4	49.5	49.5	41.3	46.0	47.9	50.1	49.7
40	44.2	46.8	50.2	51.3	51.1	43.1	47.5	49.6	51.9	51.6
50	45.9	48.4	51.9	52.8	52.6	44.9	49.1	51.4	53.5	53.4
60	47.5	50.3	53.6	54.1	54.2	46.7	50.8	53.2	55.4	55.0
70	49.0	52.0	55.8	56.1	56.2	48.7	52.9	55.0	57.5	56.5
80	51.3	53.9	58.2	59.0	57.7	51.1	55.1	56.7	59.7	58.6
90	55.5	58.3	62.5	63.9	66.0	54.1	57.4	61.3	62.6	61.8
U. L.	84.6	88.7	89.1	88.9	94.0	86.3	95.0	98.0	83.1	111.3
No. of Cases	332	252	238	160	53	330	285	291	239	175
Median	45.9±.31 P. E.	48.4±.34 P. E.	51.9±.38 P. E.	52.8±.43 P. E.	52.6±.76 P. E.	44.9±.33 P. E.	49.1±.34 P. E.	51.4±.33 P. E.	53.6±.40 P. E.	53.4±.41 P. E.
Q	4.5	4.3	4.8	4.4	4.4	4.9	4.6	4.5	4.8	4.4

TABLE 173

WEIGHT: DIFFERENCES IN KILOGRAMS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls

PERCENTILES	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	1.2	− .2	− .2	.6	−1.6
20	.2	− .3	.4	.2	− .9
30	1.1	− .6	.5	− .6	− .2
40	1.1	1.3	.6	− .6	− .5
50	1.0	− .7	.5	− .7	− .8
60	.8	− .5	.4	−1.3	− .8
70	.3	− .9	− .8	−1.4	− .3
80	.2	−1.2	1.5	− .7	− .9
90	1.4	.9	1.2	1.3	4.2

the case of height, the contrast in weight is greater in the upper than in the lower ranges of the scale. In other words, there is more difference between heavy school boys and heavy working boys than between light ones. A comparison based on the lowest 10 per cent of the two groups would show far less difference than one based on the highest 10 per cent.

In the case of the girls, the percentiles for weight (Table 172) and the table of differences (Table 173) follow much the same course as those for height, and differ from those of the boys. There is little difference in weight between school girls and working girls. This slight difference is in favor of the school girls at fourteen, but the working girls gain more rapidly than the school girls and by eighteen are a little heavier. What little advantage the school girls have at fourteen could be explained by their few months advantage in age. It is fair to say, therefore, that there is no difference in weight between school girls and working girls at fourteen years, but that the working girls gain weight faster than the school girls, particularly between sixteen and seventeen years, and are slightly heavier at eighteen. The upper and lower ranges of the table of differences show no such contrast as in the case of the boys. In other words, there is as little difference between light school girls and light working girls as between heavy ones.

VITAL CAPACITY

The ten-percentile scales for vital capacity in boys (wet spirometer test) are presented in Table 174, and the differences between the two scales in Table 175. In this case also, the school boys are very superior to the working boys. At fourteen about half of the difference can be attributed to the fact that the school boys are two months older. The difference between the two groups is progressively greater up to sixteen years, but is less at seventeen years. In this instance, as in height and weight, the working boys maintained their period of rapid growth a year longer than the school boys, and gained rapidly on them between sixteen and seventeen years. Between seventeen and eighteen, the school boys increased their vital capacity, like their weight, faster than the working boys. The difference between the two groups is much greater at eighteen years than at fourteen—in the case of the median, over three times as great. Neither in height nor in weight was the difference greater at eighteen than at fourteen.

As in the case of height and weight, the differences in the upper range of the scale are much greater than those in the lower range. In other words, the best of the school boys have a greater advantage in lung capacity over the best of the working boys than the poorest school boys have over the poorest working boys.

Whatever the factors controlling increase in vital capacity, they work more advantageously in the development of boys in school than in that of boys in industry. One would expect vital capacity, if it were a mere

TABLE 174

VITAL CAPACITY IN CUBIC CENTIMETERS

Boys

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	1350	1400	1800	1601	2650	1100	1325	1500	1600	2125
10	1928	2152	2542	2780	3047	1804	1824	2298	2680	2879
20	2090	2342	2818	3062	3320	1984	2151	2518	2888	3052
30	2268	2556	2008	3249	3631	2106	2313	2674	3057	3180
40	2313	2718	3180	3440	3766	2206	2439	2799	3241	3364
50	2423	2871	3313	3629	3913	2305	2600	2942	3389	3526
60	2554	3032	3447	3749	4111	2404	2746	3112	3543	3689
70	2701	3187	3595	3937	4283	2539	2882	3274	3694	3887
80	3035	3372	3798	4271	4430	2715	3022	3429	3866	4096
90	3384	3679	4120	4487	4730	2935	3260	3739	4112	4343
U. L.	4700	4900	5150	5500	5500	3600	4400	4600	4600	5400
No. of Cases	419	285	267	84	47	407	386	332	293	263
Median	2423 ± 21 P. E.	2871 ± 27 P. E.	3313 ± 28 P. E.	3629 ± 65 P. E.	3913 ± 85 P. E.	2305 ± 18 P. E.	2600 ± 23 P. E.	2942 ± 26 P. E.	3389 ± 30 P. E.	3526 ± 34 P. E.
Q	345	366	367	474	466	291	360	378	404	438

TABLE 175

VITAL CAPACITY: DIFFERENCES IN CUBIC CENTIMETERS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	124	328	243	100	168
20	106	191	300	174	268
30	162	243	334	192	451
40	107	279	381	199	402
50	118	271	371	240	387
60	150	286	335	206	421
70	262	305	321	243	396
80	320	350	369	405	334
90	449	419	381	375	387

TABLE 176

VITAL CAPACITY IN CUBIC CENTIMETERS

Girls

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	1150	1350	1300	1800	1305	900	1000	1200	1225	1225
10	1762	1909	2008	2084	1820	1493	1803	1866	1930	1942
20	1884	2053	2144	2242	2217	1743	1914	2037	2058	2097
30	1978	2144	2277	2334	2340	1894	2017	2137	2228	2211
40	2068	2239	2406	2434	2463	1983	2097	2234	2337	2338
50	2156	2342	2496	2550	2586	2074	2176	2323	2439	2444
60	2248	2448	2587	2673	2752	2171	2287	2414	2529	2536
70	2342	2560	2687	2803	2889	2273	2415	2525	2630	2635
80	2460	2679	2790	2957	3020	2393	2561	2663	2853	2749
90	2627	2806	3023	3168	3340	2586	2734	2888	2992	2903
U. L.	3400	3600	3800	3900	3700	3125	3200	3600	3900	3900
No. of Cases	322	246	190	116	43	320	277	276	218	148
Median	2156± 16 P. E.	2342± 21 P. E.	2496± 24 P. E.	2550± 34 P. E.	2586± 64 P. E.	2074± 18 P. E.	2176± 19 P. E.	2323± 19 P. E.	2439± 24 P. E.	2444± 28 P. E.
Q	235	261	264	296	338	257	261	254	289	269

TABLE 177

VITAL CAPACITY: DIFFERENCES IN CUBIC CENTIMETERS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	269	106	142	154	−122
20	141	139	107	184	120
30	84	127	140	106	129
40	85	142	172	97	125
50	82	166	173	111	142
60	77	161	173	144	216
70	69	145	162	173	254
80	67	118	137	104	277
90	41	72	135	176	437

measure of lung capacity, to follow the same course of growth as height and weight. Since in this case it does not, we must conclude that some factor is involved which is not concerned with height and weight. We believe it to be the element of skill in performing the test. Both the superior intelligence of school boys and their practice with the wet spirometer in the gymnasium of the high school would tend to give them an advantage, in so far as the result depends upon skill in blowing up the spirometer.

The girls, in the results of tests of vital capacity, present a picture more comparable with that of the boys than in the case of height or weight. The ten-percentile scales for school and working girls are presented in Table 176, and the differences in Table 177. The school girls show a uniform superiority to the working girls, which is much greater at eighteen than it was at fourteen. The difference between school and working girls is progressively greater up to sixteen years, is less at seventeen years, and greater again at eighteen. The fact that the working girls gain faster in vital capacity between sixteen and seventeen than the school girls corresponds with the course of events among boys.

The gain in the upper half of the scale is far more conspicuous than that in the lower half, as in the case of the boys. None of the superiority of the school girls in vital capacity can be attributed to size. They were no taller, and a trifle lighter in weight, than the working girls. This is particularly true at eighteen and in the upper half of the scale, where the difference in vital capacity is greatest. We can only conclude that the superior skill of the school girls in using the spirometer is primarily responsible for their superior record, and for the fact that the difference is even greater at eighteen than at fourteen years.

Strength of the Hand

The ten-percentile scales for strength of the hand, in kilograms, right and left hands, for school and working boys, are presented in Table 178, and the differences between the two scales in Table 179. Here again the school boys are very superior to the working boys at every age. The difference in the case of the right hand is almost twice as great as in that of the left. Among school boys there is a large and consistent superiority of the right hand, whereas among working boys there are more left-handed individuals and those who tend to be ambidextrous. This group difference in the relation of the two hands is evident at fourteen years, and is still more marked at eighteen years. The extent to which the greater degree of right-hand superiority of school boys may be due to the presence of more right-handed individuals is shown in Table 180 for each year. The table shows about 10 per cent more left-handedness among working than among school boys. Part of the greater right-hand superiority of the school group must be explained in this way—further analysis would be required to show just how much of it. The table further shows that the proportion of left-handedness tends to decrease from fourteen to eighteen in both groups. There is a tendency for right-handedness in strength to develop from fourteen to eighteen years. Since the greater right-hand superiority of the school group is even more evident at eighteen than it was at fourteen, the tables make it probable that part of the right-hand superiority of school boys is due to the fact that individual school boys show greater superiority of the right hand over the left than individual working boys, and not merely to the presence of more right-handed individuals among school boys.

The superiority of the school boys is progressively greater up to sixteen years. At seventeen it is less. In other words, between sixteen and seventeen the working boys have gained on the school boys in strength of hand just as they did in height, weight, and vital capacity. Between seventeen and eighteen the school boys increase their lead a little. At eighteen we

TABLE 178

STRENGTH OF THE HAND IN KILOGRAMS

Boys

RIGHT HAND

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	12.0	17.0	22.6	27.0	40.0	11.5	15.0	18.0	25.0	29.0
10	21.1	25.3	30.5	37.2	41.8	18.6	22.6	26.1	31.2	36.6
20	23.4	28.1	34.2	40.6	44.5	20.6	24.6	29.1	35.1	40.5
30	24.8	29.8	36.9	42.6	45.8	22.2	26.2	31.1	39.4	42.4
40	26.3	32.1	38.8	44.8	47.5	23.7	27.6	33.0	41.3	44.4
50	27.7	34.6	40.8	46.7	50.3	24.9	28.9	34.9	42.9	45.7
60	29.2	37.7	42.9	49.3	52.4	26.0	30.2	36.3	44.4	47.1
70	31.0	40.6	45.3	51.5	53.9	27.3	32.7	38.8	47.0	48.8
80	33.3	43.6	47.8	53.6	55.8	28.9	35.7	41.8	49.2	51.0
90	37.0	45.4	52.2	56.9	58.5	31.6	39.0	45.9	51.8	53.4
U. L.	73.0	72.0	83.0	73.0	65.0	45.0	48.0	55.0	59.0	62.0
No. of Cases . .	422	273	275	173	61	416	314	334	282	263
Median	27.7±.25 P. E.	34.6±.49 P. E.	40.8±.33 P. E.	46.7±.42 P. E.	50.3±.79 P. E.	24.9±.21 P. E.	28.9±.31 P. E.	34.9±.35 P. E.	42.9±.40 P. E.	45.7±.32 P. E.
Q	4.1	6.6	5.5	5.5	4.9	3.4	4.4	5.1	5.4	4.2

find their superiority to the working boys greater than it was at fourteen. In other words, in the case of strength also—as in that of height, weight, and vital capacity—the school boys reach the limit of their period of most rapid yearly gain at sixteen years, while the working boys reach it at seventeen years.

Strength of the hand is a power which one would theoretically expect to increase faster among working boys than among school boys. Many of the working boys were employed in occupations in which a demand was made upon physical strength. This expectation is not only not fulfilled but is contradicted by the results.

Since the school boys are taller and heavier than the working boys, part of their superiority in strength is doubtless due to mere size. However, since the X-M difference in size is less at eighteen than at fourteen and the difference in strength greater, we must conclude that the final superiority of the school boys is not due to size alone, but to superior muscular power and control.

The ten-percentile scales for strength of the hand in girls are presented in Table 181, and the differences between the scales for school and working

TABLE 178—*Continued*

LEFT HAND

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	9.5	16.2	20.6	24.0	31.0	12.0	14.0	15.0	23.0	25.0
10	19.5	24.2	28.8	34.5	36.9	18.5	21.3	24.1	30.8	34.0
20	22.2	26.2	31.7	36.8	39.5	20.2	23.5	27.4	33.2	37.3
30	23.6	28.6	34.5	39.4	43.1	21.9	25.2	29.6	36.9	39.7
40	24.9	30.4	35.8	41.3	44.7	23.3	26.8	31.4	38.5	41.7
50	26.3	32.4	37.8	43.3	46.1	24.6	28.5	33.1	40.2	43.7
60	27.6	34.7	40.1	45.2	48.8	25.7	29.9	35.1	42.2	45.2
70	29.3	36.8	42.4	47.3	50.8	26.9	32.1	36.8	43.8	46.5
80	31.4	39.6	45.3	49.3	52.5	28.7	34.8	39.0	46.3	48.2
90	35.3	43.0	48.3	52.2	54.8	30.7	37.6	42.8	49.7	51.0
U. L.	67.0	61.0	64.0	69.0	59.0	45.0	47.0	55.0	76.0	60.5
No. of Cases . .	421	274	277	173	60	418	316	333	281	271
Median	26.3±.23 P. E.	32.4±.41 P. E.	37.8±.40 P. E.	43.3±.49 P. E.	46.1±.83 P. E.	24.6±.21 P. E.	28.5±.39 P. E.	33.1±.32 P. E.	40.2±.40 P. E.	43.7±.34 P. E.
Q	3.8	5.4	5.4	5.1	5.2	3.4	5.6	4.7	5.0	4.5

girls in Table 182. Although the amount of difference between the two groups is again less for girls than for boys, the type of difference is very similar. School girls are superior to working girls at every age. The difference between school and working groups is greater for the right hand than for the left. The number of individuals in each group of girls showing superiority with the left hand, and the percentage of the entire group which that number represents, is shown in Table 183. In this respect, also, the two groups of girls show a similar contrast to the two groups of boys. Each year shows a larger percentage of working than of school girls who display left-hand superiority. Moreover, the proportion of left-handed individuals in both groups tends to decrease from fourteen to eighteen years.

The difference between the two groups is less at seventeen than for the previous ages, and is greater again at eighteen. The superiority

TABLE 179

STRENGTH OF THE HAND: DIFFERENCES IN KILOGRAMS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

Percentiles	Right Hand					Left Hand				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	2.5	2.7	4.4	6.0	5.2	1.0	2.9	4.7	3.7	2.9
20	2.8	3.5	5.1	5.5	4.0	2.0	2.7	4.3	3.6	2.2
30	2.6	3.6	5.8	3.2	3.4	1.7	3.4	4.9	2.5	3.4
40	2.6	4.5	5.8	3.5	3.1	1.6	3.6	4.4	2.8	3.0
50	2.8	5.7	5.9	3.8	4.6	1.7	3.9	4.7	3.1	2.4
60	3.2	7.5	6.6	4.9	5.3	1.9	4.8	5.0	3.0	3.6
70	3.7	7.9	6.5	4.5	5.1	2.4	4.7	5.6	3.5	4.3
80	4.4	7.9	6.0	4.4	4.8	2.7	4.8	6.3	3.0	4.3
90	5.4	6.4	6.3	5.1	5.1	4.6	5.2	5.5	2.5	3.8

TABLE 180

LEFT-HANDEDNESS IN STRENGTH

Boys

Age	X		M	
	No.	Per Cent	No.	Per Cent
14	85	22	133	32
15	37	13	71	23
16	50	18	77	23
17	24	14	58	21
18	6	10	48	18

of the school group is somewhat greater at eighteen than it was at fourteen. In this case, none of the superiority of the school group can be attributed to size. Superior muscular power and control must account for all of it.

STEADINESS OF THE HAND

The ten-percentile norms for steadiness of boys, right and left hand, for the school (X) and working (M) series are given in Table 184. The differences between the school and the working boys are presented in Table 185. The table of differences shows at a glance one striking contrast to the other physical measures—a superiority of the working group in the last two years. It also shows several points of likeness to the course of events in the other physical tests. At fourteen the school boys are superior, and they are even more superior at fifteen. At sixteen their superiority is less, though still present. At seventeen, the working group has gained so much more that they

TABLE 181

STRENGTH OF THE HAND IN KILOGRAMS

Girls

RIGHT HAND

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	11.0	15.0	17.0	22.0	22.0	9.0	13.0	16.0	19.0	20.0
10	19.4	22.8	24.6	25.7	26.1	16.3	20.3	21.1	24.2	24.0
20	21.2	24.8	26.0	27.3	28.0	19.1	22.6	22.9	26.2	25.7
30	22.7	25.9	27.4	28.6	29.2	20.5	23.7	24.6	27.5	27.0
40	24.0	27.1	28.6	29.8	30.3	21.6	24.8	25.8	28.7	27.8
50	25.1	28.3	29.5	30.9	31.6	22.7	25.9	27.0	29.4	28.8
60	26.1	29.3	30.3	32.1	33.0	24.7	27.0	28.0	30.2	29.8
70	27.5	30.4	31.4	33.4	34.6	25.9	28.1	29.1	31.1	31.0
80	28.9	31.8	32.4	35.3	35.9	27.4	29.4	30.4	32.2	32.2
90	30.4	33.9	35.0	37.9	38.1	29.6	31.0	32.3	34.4	34.6
U. L.	35.0	41.5	40.6	46.0	43.0	37.0	35.0	40.0	44.0	41.0
No. of Cases . .	326	245	218	150	69	330	210	275	216	137
Median	25.1±.21 P. E.	28.3±.23 P. E.	29.5±.22 P. E.	30.9±.33 P. E.	31.6±.50 P. E.	22.7±.24 P. E.	25.9±.24 P. E.	27.0±.22 P. E.	29.4±.24 P. E.	28.8±.29 P. E.
Q	3.1	2.9	2.6	3.2	3.4	3.5	2.8	3.0	2.4	2.6

have become superior to the school group, and they maintain their superiority at eighteen. Interpreted in terms of yearly growth, this means that the school boys have completed their period of rapid yearly gain at sixteen, while the working boys continue it up to seventeen. The change from seventeen to eighteen is smaller, but is in favor of the working boys. There is a tendency in this test also for the differences at the upper end of the scale to be larger than those at the lower end. The differences between the best school boys and the best working boys are greater than those between the poorest school boys and the poorest working boys. This tendency is striking in years fourteen and fifteen where the school boys are superior, but is less evident when the shift of relationship comes about in the upper years.

As in tests of strength and speed, the right-hand differences in steadiness are greater than the left-hand differences. In other words, right-handedness in steadiness also is more marked in the school than in the working group. There are more left-handed and approximately ambidextrous persons among working than among school boys.

TABLE 181—*Continued*

LEFT HAND

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	11.0	12.0	18.0	19.0	18.0	8.0	11.0	14.0	15.5	15.0
10	18.1	20.8	22.3	22.6	21.7	16.4	18.8	20.2	23.0	22.2
20	19.9	22.9	23.6	24.5	25.1	18.8	20.7	21.8	24.7	23.9
30	21.2	23.9	24.8	26.0	26.7	20.2	21.9	23.0	25.9	25.2
40	22.5	25.0	25.9	27.5	28.4	21.3	23.2	24.0	27.1	26.2
50	23.7	26.1	27.1	28.7	29.2	22.2	24.5	25.2	27.7	27.4
60	24.8	27.3	28.4	29.6	30.0	23.6	25.7	26.5	28.9	28.6
70	26.0	28.4	29.8	30.4	31.0	25.0	26.9	27.8	30.9	29.8
80	27.3	29.6	31.1	31.8	32.3	26.3	28.2	29.6	31.5	31.2
90	28.9	31.7	32.4	33.8	34.6	29.1	29.6	31.5	33.5	33.2
U. L.	37.0	37.0	40.6	40.0	39.0	37.0	35.0	39.0	41.0	42.0
No. of Cases	328	245	217	150	69	329	210	279	217	136
Median	23.7± .21 P. E.	26.1± .22 P. E.	27.1± .29 P. E.	28.7± .29 P. E.	29.2± .44 P. E.	22.2± .21 P. E.	24.5± .27 P. E.	25.2± .24 P. E.	27.7± .26 P. E.	27.4± .32 P. E.
Q	3.1	2.8	3.2	2.9	2.9	3.1	3.2	3.2	3.0	3.0

The number of individuals in each group showing superiority with the left hand is given in Table 186. In this case, as in strength, the working group contains a larger percentage of left-handed individuals than the school group. Left-handedness in steadiness is less common in both groups than left-handedness in strength. The change in proportion with age differs in the two groups. Left-handedness in steadiness is somewhat less frequent at eighteen than at fourteen among school boys and somewhat more frequent among working boys, though the change from year to year is not consistent.

A comparison of right- and left-hand differences in steadiness in the two groups shows the right-hand superiority of school boys much greater than the left at fourteen and fifteen, and about the same at sixteen. At seventeen and eighteen the superiority lies with the working group with both hands.

TABLE 182

STRENGTH OF THE HAND: DIFFERENCES IN KILOGRAMS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls

Percentiles	Right Hand					Left Hand				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	3.1	2.5	3.5	1.5	2.1	1.7	2.0	2.1	−.4	−.5
20	2.1	2.2	3.1	1.1	2.3	1.1	2.2	1.8	−.2	1.2
30	2.2	2.2	2.8	1.1	2.2	1.0	2.0	1.8	.1	1.5
40	2.4	2.3	2.8	1.1	2.5	1.2	1.8	1.9	.4	2.2
50	2.4	2.4	2.5	1.5	2.8	1.5	1.6	1.9	1.0	1.8
60	1.4	2.3	2.3	1.9	3.2	1.2	1.6	2.9	.7	1.4
70	1.6	2.3	2.3	2.3	3.6	1.0	1.5	2.0	−.5	1.2
80	1.5	2.4	2.0	3.1	3.7	1.0	1.4	1.5	.3	1.1
90	.8	2.9	2.7	3.5	3.5	−.2	2.1	.9	3	1.2

TABLE 183

LEFT-HANDEDNESS IN STRENGTH

Girls

Age	X		M	
	No.	Per Cent	No.	Per Cent
14	57	18	94	29
15	36	11	33	16
16	31	14	58	21
17	18	12	49	23
18	3	4	27	20

It is greater with the right hand than with the left at seventeen years, and about the same with the two hands at eighteen years. This shift in relationship from an initial superiority of school boys to a final superiority of working boys renders complicated and uncertain a comparison of right- and left-hand differences from year to year. However, the difference in proportion of left-handed individuals in the two groups is so small that it has little bearing on the group differences.

The ten-percentile tables for the steadiness of girls are presented in Table 187, and the differences between school (X) and working (M) girls are presented in Table 188. The course of events is, on the whole, similar to the boys. At the start school girls are superior. Their superiority is greater at fifteen than it was at fourteen. At sixteen the two groups are approximately the same, and at seventeen and eighteen the working girls are superior. In terms of yearly growth in steadiness, this means that the capacity of the school girls in steadiness reaches the completion of the period of rapid improvement at fifteen years and increases little if any

TABLE 184

STEADINESS OF THE HAND IN HOLES AND CONTACTS

Boys

Right Hand

Percentiles	X				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	I- 4	III-12	III- 6	III- 6	III- 6
10	III-10	IV- 9	IV- 5	IV- 8	IV- 3
20	III- 0	IV- 2	V- 9	V-10	V-10
30	IV-10	V-10	VI-12	V- 1	V- 6
40	IV- 8	V- 6	VI-10	VI-10	VI-10
50	IV- 1	VI-11	VI- 7	VI- 8	VI- 5
60	V-10	VI- 8	VII-11	VI- 6	VII-11
70	V- 7	VII-12	VII- 8	VII-10	VII- 8
80	VI-10	VII- 7	VIII-10	VII- 6	VII- 6
90	VII-11	VIII- 3	VIII- 2	VIII- 8	VIII-10
U. L.	IX- 6	IX- 1	IX- 0	IX- 3	IX- 6
No. of Cases . . .	425	289	278	174	55
Median	IV- 1± .63 P. E.	VI-11± .81 P. E.	VI- 7±1.09 P. E.	VI- 8± .99 P. E.	VI- 5±2.28 P. E.
Q	11.5	11.0	14.5	10.5	13.5

TABLE 184—*Continued*

RIGHT HAND

PERCENTILES	M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	I- 1	II-10	II- 7	III-12	IV- 9
10	II- 0	III-10	III- 0	V-11	V- 8
20	III-10	III- 3	IV- 8	V- 5	VI-10
30	III- 7	IV-11	IV- 0	VI- 9	VI- 6
40	III- 0	IV- 9	V- 9	VI- 6	VII-10
50	IV-11	IV- 7	V- 0	VII-10	VII- 8
60	IV- 9	IV- 2	VI- 9	VII- 8	VII- 2
70	IV- 7	V-11	VI- 6	VII- 0	VIII- 9
80	IV- 0	V- 7	VII- 7	VIII- 9	VIII- 7
90	V- 7	VI-10	VIII-11	VIII- 6	IX-10
U. L.	VII- 7	VII- 6	IX- 7	IX- 5	IX- 0
No. of Cases	406	363	340	290	279
Median	IV-11± .56 P. E.	IV- 7± .56 P. E.	V- 0± .56 P. E.	VII-10±1.02 P. E.	VII- 8± .94 P. E.
Q	9.0	8.5	15	14	13

LEFT HAND

PERCENTILES	X				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	II-12	II-11	II- 6	II-12	III- 6
10	II- 7	III- 9	IV-11	III- 1	IV-10
20	III-11	III- 0	IV- 8	IV- 9	IV- 6
30	III- 8	IV-10	IV- 4	IV- 6	IV- 1
40	III- 3	IV- 7	V-10	V-10	V-11
50	IV-11	IV- 1	V- 7	V- 7	V- 8
60	IV- 9	V- 9	VI-11	VI-11	V- 5
70	IV- 7	VI-12	VI- 8	VI- 8	VI-10
80	V-12	VI- 9	VII-12	VII-12	VI- 6
90	VI-12	VII- 8	VIII- 9	VII- 8	VII- 8
U. L.	IX- 6	IX- 4	IX- 1	IX-12	IX- 5
No. of Cases	426	288	278	174	55
Median	IV-11± .57 P. E.	IV- 1± .99 P. E.	V- 7±1.09 P. E.	V- 7±1.42 P.E.	V- 8±1.77 P. E.
Q	9.5	13.5	14.5	15	10.5

TABLE 184—*Continued*

Left Hand

Percentiles	M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	I- 6	I- 7	II- 6	II- 6	III- 3
10	II- 9	II- 2	III-11	IV-10	IV- 7
20	II- 0	III-11	III- 0	IV- 6	V-10
30	III-11	III- 8	IV-10	V-10	V- 7
40	III- 9	III- 3	IV- 8	V- 7	VI-10
50	III- 7	IV-12	IV- 5	VI-11	VI- 8
60	III- 3	IV-10	V-10	VI- 8	VII-12
70	IV-11	IV- 8	V- 7	VI- 5	VII- 9
80	IV- 7	IV- 3	VI- 9	VII- 9	VII- 8
90	IV- 5	V- 9	VII-11	VIII-11	VIII- 8
U. L.	VII-10	VII- 9	IX- 9	IX- 9	IX- 5
No. of Cases . . .	403	364	338	290	279
Median	III- 7± .50 P. E.	IV-12± .56 P. E.	IV- 5± .78 P. E.	VI-11± .99 P. E.	VI- 8±1.24 P. E.
Q	8.0	8.5	11.5	13.5	16.5

TABLE 185

STEADINESS OF THE HAND IN HOLES AND CONTACTS: DIFFERENCES IN CONTACTS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

Percentiles	Right Hand					Left Hand				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	3	14	8	−10	− 8	2	6	13	−22	− 3
20	10	14	12	− 5	−13	2	11	5	− 3	− 9
30	10	14	14	−21	−13	3	11	6	− 9	− 7
40	5	16	12	− 4	−13	6	9	11	− 3	−14
50	10	22	6	−15	−10	9	11	11	− 9	−13
60	12	20	11	−11	− 9	7	14	12	− 3	−19
70	13	25	11	−10	−12	4	22	12	− 3	−14
80	16	26	10	−10	−12	8	20	10	− 3	−11
90	22	33	9	− 2	−13	19	27	15	−10	−13

TABLE 186

LEFT-HAND SUPERIORITY IN STEADINESS

Boys

Age	X		M	
	No.	Per Cent	No.	Per Cent
14	48	11	48	12
15	19	7	38	11
16	33	12	49	15
17	20	12	31	11
18	5	9	41	15

TABLE 187

STEADINESS OF THE HAND IN HOLES AND CONTACTS

Girls

Right Hand

Percentiles	X				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	I- 6	II- 7	II- 6	I- 0	III- 8
10	III- 6	IV- 9	IV- 9	IV- 9	IV- 4
20	IV-11	V-10	IV- 0	V-12	V- 9
30	IV- 8	V- 7	V-10	V- 8	V- 2
40	IV- 0	VI-12	V- 6	V- 0	VI-10
50	V-10	VI- 8	VI-10	VI- 9	VI- 7
60	V- 7	VII-11	VI- 7	VI- 6	VI- 3
70	VI-11	VII- 7	VII-11	VII-11	VII- 8
80	VI- 8	VIII- 9	VIII-12	VII- 4	VII- 7
90	VII-12	VIII- 1	IX-12	VIII- 7	VIII-10
U. L.	IX- 8	IX- 0	IX- 0	IX- 1	IX- 8
No. of Cases . . .	329	252	225	151	55
Median	V-10± .90 P. E.	VI- 8±1.30 P. E.	VI-10±1.38 P. E.	VI- 9±1.48 P. E.	VI- 7±2.02 P. E.
Q	13.0	16.5	16.5	14.5	12.0

TABLE 187—*Continued*

RIGHT HAND

PERCENTILES	M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	II-11	II- 8	III-12	II-10	III- 9
10	III-11	IV-12	IV- 8	IV- 5	V-11
20	III- 6	IV-10	V-12	V- 8	V- 0
30	III- 0	IV- 8	V-10	VI-10	VI- 8
40	IV-11	IV- 4	V- 6	VI- 7	VI- 0
50	IV- 8	V-12	VI-11	VII-12	VII- 9
60	IV- 6	V- 9	VI- 7	VII- 9	VII- 5
70	V-12	V- 3	VII-11	VII- 6	VIII-10
80	V- 8	VI-10	VII- 7	VIII- 9	VIII- 7
90	VI-11	VI- 2	VIII- 8	IX-11	IX-10
U. L.	VIII-10	VIII- 9	IX- 5	IX- 1	IX- 4
No. of Cases	322	271	286	204	142
Median	IV- 8± .66 P. E.	V-12± .83 P. E.	VI-11±1.03 P. E.	VII-12±1.18 P. E.	VII- 0±1.47 P. E.
Q	9.5	11.0	14.0	13.5	14.0

LEFT HAND

PERCENTILES	X				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	I- 5	II-11	I- 2	I-12	III-12
10	III-12	III- 7	III- 9	III- 9	III- 2
20	III- 9	IV-11	IV-11	IV-12	IV-11
30	III- 3	IV- 8	IV- 7	IV- 9	IV- 8
40	IV-12	IV- 6	IV- 0	IV- 7	IV- 6
50	IV-10	V-10	V- 9	V-12	IV- 1
60	IV- 7	V- 7	V- 6	V- 8	V- 9
70	IV- 0	VI-11	VI- 9	V- 0	V- 5
80	V- 9	VI- 6	VII-12	VI- 6	VI- 4
90	VI-12	VIII-12	VIII-11	VII- 8	VII- 8
U. L.	IX-12	IX- 5	IX- 0	IX- 4	IX-10
No. of Cases	325	249	225	151	54
Median	IV-10± .72 P. E.	V-10±1.06 P. E.	V- 9±1.29 P. E.	V-12±1.32 P. E.	IV- 1±2.02 P. E.
Q	10.5	13.5	15.5	13.0	12.0

TABLE 187—*Continued*

LEFT HAND

PERCENTILES	M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	I- 7	I- 4	I- 3	II-11	III-12
10	II- 6	III-11	III- 1	IV-11	IV-10
20	III-12	III- 6	IV-11	IV- 5	IV- 5
30	III- 9	III- 0	IV- 9	V-11	V- 9
40	III- 6	IV-10	IV- 6	V- 7	V- 6
50	III- 1	IV- 8	V-11	VI-11	VI-10
60	IV-11	IV- 6	V- 7	VI- 8	VI- 6
70	IV- 9	V-12	VI-10	VI- 6	VII- 8
80	IV- 6	V- 9	VI- 7	VII- 6	VIII-11
90	V- 6	VI-11	VII- 9	VIII- 6	VIII- 6
U. L.	VII-10	VIII-12	IX-12	IX- 1	IX- 7
No. of Cases . .	320	271	285	205	141
Median	III- 1± .56 P. E.	IV- 8± .72 P. E.	V-11±1.03 P. E.	VI-11± .66 P. E.	VI-10±1.90 P. E.
Q	8.0	9.5	14.0	7.5	18.0

TABLE 188

STEADINESS OF THE HAND IN HOLES AND CONTACTS: DIFFERENCES IN CONTACTS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls

PERCENTILES	RIGHT HAND					LEFT HAND				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	5	3	−1	− 4	− 6	7	4	8	−11	− 5
20	8	13	−1	− 4	− 9	3	8	0	− 7	− 6
30	5	14	0	−11	− 7	6	5	2	−11	−12
40	11	18	0	− 6	−10	7	4	6	−13	−13
50	11	17	1	−10	−11	4	11	2	−14	−17
60	12	24	0	−10	−11	4	12	1	−13	−16
70	14	22	0	− 5	−11	9	14	1	− 7	−23
80	13	27	8	− 8	−13	10	16	8	−13	−19
90	12	27	9	− 9	−13	7	25	11	−15	−15

TABLE 189

LEFT-HAND SUPERIORITY IN STEADINESS

Girls

Age	X		M	
	No.	Per Cent	No.	Per Cent
14	36	11	31	10
15	21	9	30	11
16	29	13	23	9
17	9	6	35	17
18	2	4	20	14

TABLE 190

RAPIDITY OF MOVEMENT OF THE HAND IN NUMBER OF TAPS 30-SECOND PERIOD

Boys

RIGHT HAND

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	121	141	122	110	161	121	118	111	144	141
10	160	165	169	167	175	144	151	159	162	165
20	166	171	177	176	182	152	161	166	170	173
30	172	178	183	183	189	159	167	172	176	179
40	177	184	187	190	193	164	172	178	181	184
50	182	190	192	196	198	170	177	181	186	189
60	187	195	199	202	203	175	182	183	191	194
70	193	200	205	207	210	179	186	194	196	199
80	200	209	212	214	216	185	192	200	203	207
90	211	220	227	230	227	192	204	211	218	219
U. L.	246	268	270	296	270	226	300	275	266	298
No. of Cases . .	246	293	272	172	56	373	384	343	300	287
Median	182± .79 P. E.	190± .88 P. E.	192±1.10 P. E.	196±1.49 P. E.	198±2.26 P. E.	170± .84 P. E.	177± .79 P. E.	181± .94 P. E.	186± .97 P. E.	189± .99 P. E.
Q	13	15	14.5	15.5	13.5	13	12.5	14	13.5	13.5

beyond that point, while the working girls keep on gaining in steadiness at a rapid rate up to seventeen years, and more slowly to eighteen. In this case also there is a clear tendency for the differences at the upper end of the scale to be greater than those at the lower end. In other words, the difference between very steady school girls and very steady working girls is greater than the differences between the unsteady members of the two groups. This tendency is evident both during the years when the school girls are clearly superior (fourteen and fifteen) and during the years when the working girls are superior (seventeen and eighteen). The same type of contrast between right- and left-hand differences is evident. The right-hand differences are larger as long as the school girls are superior, while the left-hand differences become larger when the working girls are superior.

Once more, then, the greater degree of right-handedness among school girls is evident. It is accounted for in part by the presence of more left-handed and approximately ambidextrous persons in the working than in the school group. The number of girls showing superiority in steadiness with the left hand is shown in Table 189. As in the case of the boys, a larger proportion of working than of school girls show a left-hand superiority.

TABLE 190—*Continued*

LEFT HAND

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	101	111	114	101	111	99	110	101	103	101
10	125	132	135	132	144	117	124	131	131	135
20	133	140	144	145	150	125	132	138	141	143
30	140	145	150	153	155	131	138	143	146	149
40	145	150	156	157	160	136	143	148	151	153
50	149	155	161	163	165	140	147	152	156	158
60	154	160	166	169	170	145	152	157	162	163
70	159	166	171	174	177	151	156	163	167	168
80	166	173	180	180	185	157	162	170	175	176
90	178	184	195	194	194	165	168	180	187	187
U. L.	245	239	260	235	220	206	212	220	227	220
No. of Cases . .	426	292	271	172	56	368	382	340	300	286
Median	149 ± .79 P. E.	155 ± .99 P. E.	161 ± 1.10 P. E.	163 ± 1.33 P. E.	165 ± 2.34 P. E.	140 ± .88 P. E.	147 ± .79 P. E.	152 ± .89 P. E.	156 ± .97 P. E.	158 ± .96 P. E.
Q	13	13.5	14.5	14.0	14	13	12	13	13.5	13

It is also true—as in the case of the boys—that while left-handedness in steadiness increases from fourteen to eighteen in the working group, it decreases in the school group. Since at fourteen and fifteen the proportion of left-handed girls is about the same in the two groups, but the right-hand superiority of school girls is much greater than their left-hand superiority, the results suggest that most of the group differences are due not to differences in the number of right- and left-handed individuals in the groups, but to the differences in the relative steadiness of the two hands among school and working children.

RAPIDITY OF MOVEMENT OF THE HAND

TAPPING TEST

Rapidity of motion was tested for both hands, and the results have been summed up in ten-percentile scales for boys and girls and for the right and

TABLE 191

RAPIDITY OF MOVEMENT OF THE HAND IN NUMBER OF TAPS 60-SECOND PERIOD

Boys

RIGHT HAND

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	221	261	270	210	281	219	204	201	279	271
10	301	311	319	320	333	273	287	302	309	316
20	312	323	339	339	348	920	303	315	323	329
30	323	337	349	350	363	303	314	327	333	339
40	332	347	357	361	368	312	324	337	344	349
50	341	357	368	374	375	321	334	347	354	357
60	351	367	380	386	392	330	344	357	363	369
70	361	377	391	398	406	339	353	367	374	378
80	376	391	405	415	422	350	364	378	388	391
90	394	414	427	446	452	364	379	399	411	414
U. L.	526	523	516	552	542	443	571	521	488	575
No. of Cases	426	293	270	172	56	370	384	342	302	287
Median	341±1.57 P. E.	357±1.97 P. E.	368±2.05 P. E.	374±2.95 P. E.	375±4.97 P. E.	321±1.55 P. E.	334±1.58 P. E.	347±1.75 P. E.	354±1.95 P. E.	357±1.92 P. E.
Q	26	27	27	31	29	24	25	26	27	26

left hand separately. The number of taps in the first 30 seconds and the number in 60 seconds have both been summed up with the idea of getting an indication of differences in rate of fatigue if such exist. The percentile scales for boys, school and working groups, are given in Tables 190 and 191. The differences between the scales of working and school groups are given in Tables 192 and 193. It is evident at a glance that school boys are superior to working boys in rapidity of motion at every age from fourteen to eighteen, and with both right and left hands. The difference is three to four times the amount of yearly gain in rapidity and therefore cannot be accounted for by the three months' advantage in age of the working group. There are several tendencies evident in these tables which are characteristic of previous scales of physical ability. The superiority of the school group is greater in magnitude at fourteen, fifteen, and sixteen years than at seventeen and eighteen. There is a decided drop in the lead of the school group, which must mean that in the year from sixteen to seventeen working boys make a larger gain in rapidity than school boys—just as they did in vital capacity, strength, and steadiness. At eighteen the school boys maintain the superiority which remained to them. In this

TABLE 191—*Continued*

LEFT HAND

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	148	217	217	191	241	179	203	201	193	221
10	234	248	258	260	265	223	228	246	253	260
20	249	263	274	277	284	235	248	260	267	275
30	262	273	286	291	293	246	260	269	278	284
40	271	283	298	303	304	256	268	279	287	292
50	280	293	307	315	315	266	276	289	297	300
60	288	303	317	325	324	275	285	298	308	310
70	296	314	328	334	334	285	294	309	320	321
80	310	326	344	347	350	296	304	320	333	327
90	333	345	369	370	378	313	318	338	354	350
U. L.	479	461	491	478	410	391	402	404	439	423
No. of Cases	426	293	271	172	56	367	382	340	300	287
Median	280±1.45 P. E.	293±2.04 P. E.	307±2.13 P. E.	315±2.76 P. E.	315±4.51 P. E.	266±1.62 P. E.	276±1.47 P. E.	289±1.69 P. E.	297±1.95 P. E.	300±1.62 P. E.
Q	24	26	28	29	27	25	23	25	27	22

TABLE 192

RAPIDITY OF MOVEMENT OF THE HAND: DIFFERENCES IN NUMBER OF TAPS IN 30 SECONDS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

Percentiles	Right Hand					Left Hand				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	16	14	10	5	10	8	8	4	1	9
20	14	10	11	6	9	8	8	6	4	7
30	13	11	11	7	10	9	7	7	7	6
40	13	12	9	9	9	9	7	8	6	7
50	12	13	11	10	9	9	8	9	7	7
60	12	13	16	11	9	9	8	9	7	7
70	14	14	11	11	11	8	10	8	7	9
80	15	17	12	11	9	9	11	10	5	9
90	19	16	16	12	8	13	16	15	7	7

TABLE 193

RAPIDITY OF MOVEMENT OF THE HAND: DIFFERENCES IN NUMBER OF TAPS IN 60 SECONDS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

Percentiles	Right Hand					Left Hand				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	28	24	17	11	17	11	20	12	7	5
20	22	20	24	16	19	14	15	14	10	9
30	20	23	22	17	24	16	13	17	13	9
40	20	23	20	17	19	15	15	19	16	12
50	20	23	21	20	18	14	17	18	18	15
60	21	23	23	23	23	13	18	19	17	14
70	22	24	24	24	28	11	20	19	14	13
80	26	27	27	27	31	16	22	40	14	23
90	30	35	47	35	28	20	27	31	16	28

TABLE 194

LEFT-HANDEDNESS IN RAPIDITY

Boys

AGE	X		M	
	No.	Per Cent	No.	Per Cent
14	21	5	29	8
15	11	4	21	5
16	19	7	23	7
17	16	9	22	7
18	3	5	14	5

TABLE 195

RAPIDITY OF MOVEMENT OF THE HAND IN NUMBER OF TAPS 30-SECOND PERIOD

Girls

RIGHT HAND

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	131	139	140	145	109	96	105	127	126	120
10	156	162	162	164	171	147	152	160	162	161
20	164	168	170	173	178	154	159	165	167	168
30	171	173	174	179	182	160	164	169	171	173
40	174	177	179	183	185	164	168	173	175	177
50	178	182	183	188	188	167	172	177	179	180
60	183	186	188	192	191	171	175	180	184	184
70	188	191	193	197	198	176	179	187	188	188
80	195	198	200	202	207	180	185	193	194	193
90	203	208	208	209	219	188	195	200	204	202
U. L.	221	246	298	259	260	225	234	244	252	240
No. of Cases	329	250	235	158	69	296	281	290	234	174
Median	178± .83 P. E.	182±1.18 P. E.	183±1.02 P. E.	188±1.19 P. E.	188±1.73 P. E.	167± .54 P. E.	172± .56 P. E.	177±1.10 P. E.	179± .90 P. E.	180± .95 P. E.
Q	12	15	12.5	12	11.5	7.5	7.5	15	11	10

instance also the degree of superiority of the school boys is greater in the upper than in the lower half of the scale. In other words, the best of the school boys show greater superiority over the best of the working boys than the poorest of the school boys do over the poorest of the working boys. There is also—as in the case of strength—a much greater superiority of school boys with the right hand than with the left. Table 194 shows the number of individuals in each group who show superior rapidity with the left hand. The proportion is much smaller in both groups than it was either in strength or in steadiness. The range is less than 10 per cent for both groups and all five years in left-hand superiority in speed, whereas it was from 7 to 15 per cent in steadiness and from 18 to 32 per cent in strength. In the case of speed, the proportion of working and of school boys who display left-hand superiority is nearly the same—only slightly greater for the working group. Accordingly, the fact that school boys show much more superiority over working boys with the right hand than with the left must be due to the fact that school boys as a group display more superiority of the right hand over the left than working boys. In other words, school

TABLE 195—*Continued*

LEFT HAND

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	101	93	109	110	53	86	91	100	95	111
10	125	122	132	134	132	117	121	126	131	131
20	132	136	139	141	143	125	130	133	138	139
30	138	142	144	146	150	130	135	139	143	144
40	143	147	150	151	154	135	139	143	146	149
50	147	151	155	155	158	140	143	148	150	153
60	151	156	159	160	163	145	148	153	155	157
70	156	160	164	166	168	150	153	157	159	161
80	162	166	169	172	174	156	159	162	166	167
90	169	174	178	180	182	166	168	170	175	177
U. L.	201	203	245	205	220	198	201	211	221	220
No. of Cases . .	328	249	234	158	69	295	282	289	231	173
Median	147± .83 P. E.	151± .95 P. E.	155±1.02 P. E.	155±1.24 P. E.	158±1.81 P. E.	140± .91 P. E.	143± .86 P. E.	148± .89 P. E.	150± .86 P. E.	153±1.04 P. E.
Q	12	12	12.5	12.5	12	12.5	11.5	12	10.5	11

boys are more right-handed in speed than working boys, though they include no greater proportion of right-handed individuals.

In comparing the 30- and 60-second differences, there is evidence that at fourteen and fifteen the school boys, while they tap more rapidly than the working boys, do not keep up the pace in the second half minute as well as the working group. If the advantage in rate were evenly distributed between the first and the second half minute, then the 60-second difference between school and working boys should be twice the 30-second difference. As a matter of fact, it is less than twice at fourteen and fifteen and is twice or more at sixteen, seventeen, and eighteen. The ratio tends to be considerably more than twice in the upper ranges of the scale. In other words, there are indications of more fatigue among school than among working boys at fourteen and fifteen years, but less fatigue at sixteen, seventeen, and eighteen years.

TABLE 196

RAPIDITY OF MOVEMENT OF THE HAND IN NUMBER OF TAPS 60-SECOND PERIOD

Girls

Right Hand

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	241	261	270	261	240	216	201	221	239	222
10	295	305	310	312	326	280	285	302	298	310
20	307	317	324	328	335	291	301	314	320	323
30	318	329	332	341	340	301	309	323	328	332
40	327	337	340	350	351	308	317	329	335	339
50	335	345	348	359	357	315	325	335	342	346
60	344	354	357	368	363	323	332	342	354	352
70	354	363	366	376	376	333	339	351	359	357
80	365	375	376	387	387	344	351	361	369	367
90	381	393	390	399	416	357	367	377	382	385
U. L.	421	476	481	491	491	430	440	454	488	454
No. of Cases . .	328	250	235	158	69	296	281	289	234	174
Median	335±1.65 P. E.	345±1.82 P. E.	348±1.78 P. E.	359±2.38 P. E.	357±3.31 P. E.	315±1.60 P. E.	325±1.48 P. E.	335±1.39 P. E.	342±1.64 P. E.	346±1.61 P. E.
Q	24	23	22	24	22	22	20	19	20	17

TABLE 196—*Continued*

LEFT HAND

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	184	235	210	209	157	167	175	201	196	221
10	233	244	248	258	250	222	231	241	247	253
20	248	258	263	270	276	238	246	252	263	265
30	258	268	275	280	287	247	256	263	272	276
40	267	277	286	289	295	255	265	273	281	285
50	275	286	294	297	303	263	272	282	288	292
60	283	294	303	306	310	273	280	289	295	300
70	292	303	311	315	318	281	290	297	304	308
80	302	314	320	326	329	294	300	307	316	317
90	317	329	337	344	339	311	315	321	334	337
U. L.	361	372	467	420	410	372	372	407	411	390
No. of Cases	328	249	234	158	69	297	280	289	231	173
Median	275±1.50 P. E.	286±1.28 P. E.	294±1.96 P. E.	297±2.28 P. E.	303±3.13 P. E.	263±1.68 P. E.	272±1.64 P. E.	282±1.62 P. E.	288±1.72 P. E.	292±1.98 P. E.
Q	22	23	24	23	21	23	22	22	21	21

TABLE 197

RAPIDITY OF MOVEMENT OF THE HAND: DIFFERENCES IN NUMBER OF TAPS IN 30 SECONDS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls

PERCENTILES	RIGHT HAND					LEFT HAND				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	9	10	2	2	10	8	1	6	3	1
20	10	9	5	6	10	7	6	6	3	4
30	11	9	5	8	9	8	7	5	3	6
40	10	9	6	8	8	8	8	7	5	5
50	11	10	6	9	8	7	8	7	5	5
60	12	11	8	8	7	6	8	6	5	6
70	12	12	6	9	10	6	7	7	7	7
80	15	13	7	8	14	6	7	7	6	7
90	5	13	8	5	17	3	6	8	5	5

The ten-percentile scales for girls, right and left hands, working and school groups, 30- and 60-second periods, for each age from fourteen to eighteen, are presented in Tables 195 and 196. The differences between school and working girls are given in Tables 197 and 198. As in other measurements of physical ability, the superiority of the school girls is less in amount than that of the school boys, but it is consistent throughout the five years, for both hands, and for both time intervals. The magnitude of the difference is at least twice as great as the yearly differences, and therefore could not be accounted for by the three months' superiority of the school girls in age. In the case of the girls, the differences between the two groups are greater at fourteen and at fifteen than at any of the subsequent years. In other words, the school girls have apparently completed their period of marked yearly increase in rapidity of motion by the time they are

TABLE 198

RAPIDITY OF MOVEMENT OF THE HAND: DIFFERENCES IN NUMBER OF TAPS IN 60 SECONDS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls

PERCENTILES	RIGHT HAND					LEFT HAND				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	15	20	8	14	16	11	13	7	11	−3
20	16	16	10	8	12	10	12	11	6	11
30	17	20	9	13	12	11	12	12	8	11
40	19	20	11	15	12	12	12	13	8	10
50	20	20	13	17	11	12	16	12	9	11
60	21	22	15	14	11	10	14	14	11	10
70	21	24	15	17	19	11	13	14	11	10
80	21	24	15	18	20	8	14	13	10	12
90	24	26	13	17	31	6	14	16	10	2

TABLE 199

LEFT-HANDEDNESS IN RAPIDITY

Girls

AGE	X		M	
	No.	Per Cent	No.	Per Cent
14	9	3	22	7
15	5	2	21	7
16	7	3	16	6
17	7	4	12	5
18	4	6	10	6

fifteen years, whereas the working girls go on gaining at the same rate up to sixteen years. As in the case of the boys, the school girls complete their period of rapid growth in this capacity a year earlier than the working girls—but the girls are in both instances a year earlier than the boys. In other words, fifteen marks the completion of the period of rapid gain for the school girls and sixteen marks it for the school boys, while sixteen marks the termination of rapid growth for working girls and seventeen for working boys.

The same difference between right and left hand obtains for girls as for boys. The school girls show a much greater degree of superiority with the right than with the left hand. Table 199 shows the number and proportion of girls in each group, at each year, who show a left-hand superiority in speed. As in the case of the boys, the proportion is much less than for steadiness or strength. It ranges from 2 to 7 per cent for speed, from 4 to 17 per cent for steadiness, and from 4 to 29 per cent for strength. School girls show a smaller proportion of left-handed individuals than working girls at every age up to eighteen, where the numbers are small and the proportion the same. Part of their more marked right-hand superiority as compared with the working group can doubtless be explained in this way, but not all of it, since at eighteen, where the proportion of left-handed individuals is the same, the greater degree of right-hand superiority among school girls is still evident.

The comparison of the differences for 30- and for 60-second periods gives some indication of the part played by fatigue in the case of the girls. At fourteen years the difference between the two groups for the 60-second period is somewhat less than twice that for the 30-second period, which means that the school girls did not maintain their superiority in speed as well in the second half of the period as in the first. They showed a slightly greater fatigue effect than the working girls. At fifteen and sixteen the ratio of the differences is about two to one, which means no distinction between the two groups in the matter of fatigue. At seventeen and eighteen the school girls again show more sign of fatigue than the working girls. In this respect their results differ from the boys, among whom the school boys showed not only greater speed but less sign of fatigue in the years seventeen and eighteen.

The degree of fatigue displayed in a tapping test depends in part on the amount of initial effort. Particularly in the early years, we thought that school children really tried harder for speed at the beginning of the test, and therefore did not keep up the pace quite so well as the working group. How much of the tendencies noted in this section is to be attributed to differences in the degree of initial effort, and how much to differences in degree of fatigue, when the initial effort remains constant, it is impossible to say.

CARD-SORTING

The ten-percentile scales for boys in card-sorting, time and index, are presented in Tables 200 and 201. The differences between the school series (X) and the working series (M) are presented in Table 202. In this case, as in all other physical measurements, the school boys are superior to the working boys. The difference between the two series is larger than the entire yearly gain due to age and cannot therefore be explained by the few months advantage in age of the school boys. The type of change in the relationship of the two groups from year to year is a little different in this case from that observed in the other physical capacities. The school boys keep about the same degree of advantage up to fifteen years, and a less but fairly constant advantage from sixteen to eighteen years. Interpreted, this means that in this type of coördination both groups reach the limit of their period of rapid improvement a year earlier than in other types of physical skill. The school boys at fifteen and the working boys at sixteen reach the

TABLE 200

CARD-SORTING — TIME IN SECONDS

Boys

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	73.9	61.8	63.2	55.0	63.0	113.0	76.8	75.6	109.6	75.0
10	54.4	49.6	47.0	45.3	43.5	61.1	55.2	52.7	49.8	49.8
20	50.6	46.6	43.9	42.9	40.4	56.9	52.1	48.8	46.8	45.2
30	48.1	44.1	42.2	40.6	39.0	54.0	49.5	46.3	44.4	43.3
40	45.9	42.4	40.5	39.1	37.8	51.7	47.6	44.1	42.7	41.4
50	44.2	40.7	39.0	37.9	36.5	49.6	45.8	42.3	41.0	39.6
60	42.6	39.1	37.6	36.6	35.3	47.4	43.8	40.4	39.3	38.1
70	41.2	37.6	36.2	35.4	33.5	45.3	42.1	38.6	37.7	36.5
80	39.3	35.2	34.6	33.6	31.7	42.8	40.3	36.8	36.1	34.9
90	36.5	33.7	31.9	31.5	30.0	40.3	36.9	34.6	33.6	32.2
U. L.	25.2	27.0	27.6	22.4	24.0	29.1	27.8	25.6	25.4	26.6
No. of Cases	425	292	284	171	62	432	387	338	299	292
Median	44.2± .28 P. E.	40.7± .33 P. E.	39.0± .29 P. E.	37.9± .35 P. E.	36.5± .56 P. E.	49.6± .36 P. E.	45.8± .20 P. E.	42.3± .34 P. E.	41.0± .33 P. E.	39.7± .31 P. E.
Q	4.6	4.5	3.9	3.7	3.6	5.7	4.6	5.0	4.4	4.2

limit of most rapid yearly gain. During the remaining years, however, both groups gain steadily, though more slowly, from year to year up to eighteen, and the rate of gain is similar for the two groups.

A comparison of the norms for time and those for index, in which errors play a part, shows that at fourteen and fifteen the differences between school and working boys is greater in time than in index. In other words, when records are penalized for errors, the working boys compare more favorably with school boys than when time alone is considered. This must mean that school boys, while their speed was materially greater than that of working boys, made more errors. After fifteen years, there is no consistent type of contrast between the scales for time and those for index. Apparently in the three upper years, the tendency to make errors was about the same for the two groups.

Card-sorting, unlike size, vital capacity, strength, and rapidity, shows greater differences between school and working boys in the lower than in the upper ranges of the scale. In other words, there is a greater contrast

TABLE 201

CARD-SORTING — INDEX IN SECONDS

Boys

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	78.0	65.9	63.2	74.5	68.0	80.6	78.5	77.2	109.6	79.9
10	57.0	52.1	48.8	47.7	44.9	63.7	57.2	54.2	51.4	51.4
20	53.0	48.5	45.1	43.5	41.5	58.8	53.4	50.1	48.1	46.7
30	50.2	45.7	43.1	41.5	39.3	55.0	50.4	47.1	45.6	44.0
40	48.0	43.5	41.3	39.7	38.1	52.9	48.3	44.6	43.6	42.1
50	45.7	41.5	39.6	38.6	37.0	50.7	46.4	42.9	41.7	40.3
60	43.8	39.6	38.1	38.4	35.8	48.4	44.5	41.3	39.8	38.7
70	42.0	38.0	36.8	35.9	34.2	45.9	42.6	39.3	38.2	37.1
80	40.1	36.5	35.3	34.3	32.1	43.4	40.7	36.6	36.5	35.4
90	37.0	34.6	33.2	32.9	29.4	40.9	37.4	33.4	34.2	32.5
U. L.	25.7	27.2	27.6	22.4	24.0	29.3	28.4	26.2	25.4	24.7
No. of Cases . .	425	291	284	171	62	403	372	338	295	288
Median	45.7± .32 P. E.	41.5± .36 P. E.	39.6± .30 P. E.	38.6± .35 P. E.	37.3± .64 P. E.	50.7± .37 P. E.	46.4± .33 P. E.	43.8± .34 P. E.	41.7± .36 P. E.	40.3± .30 P. E.
Q	5.3	4.9	4.0	3.7	4.0	6.1	5.1	5.1	4.8	4.6

TABLE 202

CARD-SORTING: DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

Percentiles	Time in Seconds					Index in Seconds				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	6.7	5.6	5.7	4.5	6.3	6.7	5.1	5.4	3.7	6.5
20	6.3	5.5	4.9	3.9	4.8	5.8	5.9	5.0	4.6	5.2
30	5.9	5.4	4.1	3.8	4.3	4.8	4.7	4.0	4.1	4.7
40	5.8	5.2	3.6	3.6	3.6	4.9	4.8	3.3	3.9	4.0
50	5.4	5.1	3.3	3.1	3.1	5.0	4.9	3.3	3.1	3.3
60	4.8	4.7	2.8	2.7	2.8	4.6	4.9	3.2	1.4	2.9
70	4.1	4.5	2.4	2.3	3.0	3.9	4.6	2.5	2.3	2.9
80	3.5	5.1	2.2	2.5	3.2	3.3	4.2	1.3	2.2	3.3
90	3.8	3.2	2.7	2.1	2.2	3.9	2.8	0.2	1.3	3.1

TABLE 203

CARD-SORTING — TIME IN SECONDS

Girls

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	87.0	70.2	64.4	54.0	46.2	80.0	79.8	65.8	65.4	59.8
10	50.9	47.6	44.1	42.9	43.1	54.1	49.1	45.0	45.0	44.6
20	47.1	44.1	41.5	39.9	40.2	49.9	46.0	43.0	42.5	42.0
30	44.6	42.1	39.5	38.6	37.7	47.9	43.9	41.0	40.0	39.7
40	43.0	40.2	38.2	37.3	35.2	45.9	42.2	39.5	38.6	38.8
50	41.4	38.6	36.9	35.9	34.1	44.2	40.5	38.3	37.3	37.1
60	39.9	36.9	35.6	34.6	33.0	42.6	39.0	37.1	35.9	35.7
70	38.2	35.2	34.1	33.2	31.9	40.3	37.5	35.9	34.5	34.2
80	36.5	33.4	32.5	31.8	30.8	39.3	36.0	34.3	32.9	32.4
90	34.2	31.6	30.8	30.4	28.9	36.7	33.6	31.8	31.2	30.6
U. L.	23.0	26.0	22.6	26.0	26.0	30.6	27.4	27.4	26.8	25.0
No. of Cases . .	333	253	235	158	69	326	279	288	236	187
Median	41.4± .30 P. E.	38.6± .34 P. E.	36.9± .28 P. E.	35.9± .24 P. E.	34.1± .59 P. E.	44.2± .32 P. E.	40.5± .30 P. E.	38.3± .25 P. E.	37.3± .31 P. E.	37.1± .35 P. E.
Q	4.3	4.4	3.6	3.4	3.8	4.6	4.1	3.5	3.8	3.8

between inferior school boys and inferior working boys in this capacity than there is between superior school boys and superior working boys.

The ten-percentile scales in card-sorting for girls, time and index, are presented in Tables 203 and 204. The differences between the scale for school girls and that for working girls are presented in Table 205. Here again the school girls are superior to the working girls, though the amount of difference is less than in the case of the boys. The largest difference between school and working girls obtains at fourteen years. From fifteen years on, the advantage of the school girls is smaller but is maintained at about the same level from year to year up to eighteen. In this instance, then, the school girls complete their period of most rapid yearly gain at fourteen years, while the working girls keep on up to fifteen years. No contrast appears between the upper and the lower ranges of the scale of difference. In other words, the degree of difference between superior school and working girls in this capacity is about the same as that between the inferior school and working girls.

TABLE 204

CARD-SORTING — INDEX IN SECONDS

Girls

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	87.0	74.8	69.3	54.0	55.0	83.5	83.3	67.2	66.8	61.1
10	51.9	48.8	44.0	43.5	44.0	54.7	51.3	46.9	47.7	45.6
20	47.9	45.1	42.1	40.8	41.1	51.4	46.9	43.6	43.9	42.7
30	44.9	43.0	40.3	39.1	39.0	48.9	44.2	42.3	41.3	40.1
40	43.4	41.0	38.5	37.9	37.3	47.0	42.5	40.6	39.3	38.6
50	41.9	39.2	37.2	36.3	35.6	45.0	40.8	39.3	37.9	37.2
60	40.4	37.5	36.1	35.4	34.1	43.5	39.1	38.1	36.4	35.7
70	38.6	35.9	34.9	33.9	32.6	41.9	37.6	36.9	35.1	34.1
80	36.7	33.9	33.5	32.3	31.2	40.3	36.0	35.5	33.3	32.4
90	34.7	31.6	31.8	30.8	29.1	37.4	33.6	33.2	31.5	30.7
U. L.	28.0	26.2	22.6	27.1	26.0	31.4	28.5	27.2	26.8	25.0
No. of Cases . .	331	253	235	158	64	319	279	288	236	178
Median	41.9± .30 P. E.	39.2± .29 P. E.	37.2± .28 P. E.	36.3± .30 P. E.	35.6± .61 P. E.	45.0± .28 P. E.	40.8± .33 P. E.	39.3± .25 P. E.	37.9± .34 P. E.	37.2± .37 P. E.
Q	4.4	4.6	3.5	3.1	4.1	4.1	4.4	3.4	4.2	4.1

TABLE 205

CARD-SORTING: DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls

Percentiles	Time in Seconds					Index in Seconds				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	3.2	1.5	.9	2.1	1.5	2.8	2.3	2.9	4.2	1.6
20	2.8	1.9	1.5	2.6	.8	3.5	1.8	1.5	3.1	1.6
30	3.3	1.8	1.5	1.4	2.0	4.0	1.2	2.0	2.2	1.1
40	2.9	2.0	1.3	1.3	3.6	3.6	1.5	2.1	1.4	1.3
50	3.8	1.9	1.4	1.4	3.0	3.1	1.6	2.1	1.6	1.6
60	2.7	2.1	1.5	1.3	2.7	3.1	1.6	2.0	1.0	1.6
70	2.1	2.3	1.8	1.3	2.3	3.3	1.7	2.0	1.2	1.5
80	2.8	2.6	1.8	1.1	1.6	5.6	2.1	2.0	1.0	1.2
90	2.5	2.0	1.0	0.8	1.7	2.7	2.0	1.4	0.7	1.6

TABLE 206

PHYSICAL TESTS: PERCENTILE RANK OF SCHOOL AND WORKING MEDIANS

Boys

	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
Height	57	61	62	59	57	42	43	40	47	49
Weight	59	58	60	58	60	42	43	42	48	48
Vital Capacity .	57	61	62	62	68	47	43	39	47	46
Steadiness										
Right	60	69	58	40	35	33	25	38	60	53
Left	57	63	65	45	30	30	33	46	55	58
Tapping										
Right 30″ . .	62	65	58	62	65	38	40	38	45	46
Left 30″ . . .	58	60	58	59	62	40	44	40	45	48
Right 60″ . .	61	64	58	63	53	39	40	41	45	35
Left 60″ . . .	59	60	59	60	62	42	43	42	45	47
Card-Sorting										
Time	62	63	59	55	66	37	38	40	34	45
Index	61	65	60	60	66	41	40	40	42	48
Grip										
Right	61	64	65	62	72	40	38	39	43	46
Left	58	62	64	62	63	44	40	39	44	47

Summary of Differences between School and Working Children in Physical Tests

To assist in summing up the differences found in the several measures taken, the median percentile rank of each age and sex group in each test was graded on the general percentile scale. For instance, the median height of school boys at fourteen years is 154.3 and the median height of working boys at the same age is 151.3. When graded on the general scale, which is based upon the combined record of working and school boys, 154.3 has a percentile rank of 57 and 151.3 a percentile rank of 42. The median school boy thus stands 15 percentiles higher on the scale than the median working boy. This method of measuring differences reduces all the measures to a common standard and makes the degree of difference directly comparable from one measure to another. It is, of course, a measure in relative terms only, and gives no indication of the absolute size of the differences involved.

The percentile ranks on the general scale for all of the medians in physical tests of boys are given in Table 206. The differences between the percentile ranks of the medians of school boys and those of working boys (X-M) are given in Table 207.

This shows at a glance that there is only one test in which working boys were at any time superior to school boys, and that is the steadiness test in years seventeen and eighteen. In height, weight, steadiness, rapidity of

TABLE 207

PHYSICAL TESTS: DIFFERENCES BETWEEN THE PERCENTILE RANKS OF SCHOOL AND WORKING MEDIANS (X-M)

Boys

	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
Height	15	18	22	12	8
Weight	17	15	18	10	12
Vital Capacity	10	18	23	15	22
Steadiness					
Right	27	44	20	−20	−18
Left	27	30	19	−10	−28
Tapping					
Right 30″	24	25	20	17	19
Left 30″	18	16	18	14	14
Right 60″	22	24	17	18	18
Left 60″	17	17	17	15	15
Card-Sorting					
Time	25	25	19	21	21
Index	20	25	20	18	18
Grip					
Right	21	26	26	19	26
Left	14	22	25	18	16

TABLE 208

PHYSICAL TESTS: SCALE OF AVERAGE PERCENTILE RANKS

Boys

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	36.9	38.6	37.6	38.7	42.6	23.1	23.2	24.7	26.7	29.9
20	44.2	45.4	46.6	45.2	51.9	28.9	30.2	31.9	34.1	39.5
30	49.9	51.9	53.5	50.6	56.3	35.5	34.9	37.4	38.8	43.6
40	54.4	56.9	58.6	55.7	59.7	39.1	39.9	41.6	43.0	47.4
50	59.7	61.3	62.4	59.3	62.8	43.6	43.9	44.8	47.0	51.2
60	64.6	66.8	65.7	64.1	66.2	47.8	47.8	48.9	51.0	55.0
70	68.6	72.4	70.2	68.5	70.5	52.4	51.6	54.0	55.4	60.9
80	74.4	77.9	75.0	75.1	74.3	58.0	55.8	59.9	60.2	65.5
90	79.6	83.6	81.4	79.2	79.1	63.6	62.9	70.2	69.4	71.4
No. of Cases . .	430	293	283	173	61	438	390	345	311	295
Median	59.7± .7 P.E.	61.3±1.0 P.E.	62.4± .8 P.E.	59.3±1.1 P.E.	62.8±1.5 P.E.	43.6± .7 P.E.	43.9± .7 P.E.	44.8± .8 P.E.	47.0± .8 P.E.	51.2± .8 P.E.
Q	12.2	13.3	11.3	12.0	9.2	11.5	10.6	11.2	10.7	10.8

TABLE 209

PHYSICAL TESTS: DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES OF AVERAGE PERCENTILE RANKS (X-M)

Boys

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	13.8	15.4	12.9	12.0	12.7
20	15.3	15.2	14.7	11.1	12.4
30	14.4	17.0	16.1	11.8	12.7
40	15.3	17.0	17.0	12.7	12.3
50	16.1	17.4	17.6	12.3	11.6
60	16.8	19.0	16.8	13.1	11.2
70	16.2	20.8	16.2	13.1	9.6
80	16.4	22.1	15.1	14.9	8.8
90	16.0	20.7	11.2	9.8	7.7

tapping, and card-sorting, working boys gain on school boys between the ages of fourteen and eighteen. In those measures they are more nearly the equals of school boys at eighteen than they were at fourteen, though they are still inferior in every test except steadiness. In vital capacity and in strength of the hand, the superiority of the school boys is greater at eighteen than it was at fourteen. It is unexpected that in the two measures which seem most closely related to size—vital capacity and strength—school boys should go on increasing their lead, while working boys are gaining on them in size.

In order to obtain a general summary of the course of events in physical development, a ten-percentile summary of the average percentile ranks in physical tests for school boys (X) and working boys (M) separately is presented in Table 208. The difference between the scale for school boys and that for working boys is presented in Table 209. The table shows in convenient form facts which can be derived by inspection of the more detailed analysis of the same set of records in the previous table. School boys are superior at every age in physical skill. They are less superior at eighteen than they were at fourteen. The year of greatest superiority falls at year fifteen. The largest gain on the part of the working boys falls in the year between sixteen and seventeen. It is interesting to note that at years fourteen and fifteen the superiority of the school boys is greatest in the upper ranges of the scale. That is to say, there is a greater difference between superior school boys and superior working boys than there is between inferior ones. By the time year eighteen is reached, this tendency is reversed and there is a greater difference between inferior school boys and inferior working boys than there is between superior ones. This shift can be in part explained by the fact that the school boys as a group reach physical maturity earlier, by one or two years, than the working boys. At fifteen, many of the school boys, but fewer of the working boys, are near adult capacity. By sixteen and seventeen, the more slowly developing working group have approached their adult capacity, and therefore are less inferior to the school group in the upper ranges of the scale than they were at fifteen.

The comparisons for girls in terms of the percentile rank of the medians in physical tests of school girls (X) and working girls (M) separately, rated on the general scale, is given in Table 210. The differences between school girls and working girls are given in Table 211. To illustrate once more, the median record of fourteen-year-old school girls for time in card-sorting is 41.4 seconds; for working girls it is 44.2 seconds. When rated on the general scale, a record of 41.4 seconds has a percentile rank of 62 while a record of 44.2 seconds has a percentile rank of 41. Thus the median school girl ranks 21 percentiles higher on the general scale (made up of the combined records of working girls and school girls) than the median working girl.

TABLE 210

PHYSICAL TESTS: PERCENTILE RANK OF SCHOOL AND WORKING MEDIANS

Girls

	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
Height	47	50	51	53	53	52	50	49	49	49
Weight	53	45	51	48	47	47	49	49	52	51
Vital Capacity .	57	57	60	58	62	48	42	43	47	47
Steadiness										
Right	58	60	50	43	38	30	32	48	59	58
Left	48	58	53	38	33	38	30	48	60	58
Tapping										
Right 30″ . .	63	65	56	63	65	35	40	43	42	43
Left 30″ . . .	58	58	58	55	60	43	41	43	45	48
Right 60″ . .	60	63	60	63	48	38	40	42	43	31
Left 60″ . . .	57	59	58	58	60	43	43	43	45	56
Card-Sorting										
Time	62	57	55	64	65	41	46	46	46	45
Index	61	56	60	57	62	40	46	43	45	47
Grip										
Right	57	60	63	61	67	40	39	40	45	42
Left	56	57	58	54	60	44	43	43	46	44

TABLE 211

PHYSICAL TESTS: DIFFERENCES BETWEEN THE PERCENTILE RANKS OF SCHOOL AND WORKING MEDIANS (X-M)

Girls

	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
Height	− 5	0	2	4	4
Weight	6	− 4	2	− 4	− 4
Vital Capacity . .	9	15	17	11	15
Steadiness					
Right	28	28	2	−16	−20
Left	10	28	5	−22	−25
Tapping					
Right 30″ . . .	28	25	13	21	22
Left 30″	15	17	15	10	12
Right 60″ . . .	22	23	18	20	17
Left 60″	14	16	15	13	14
Card-Sorting					
Time	21	11	9	18	20
Index	21	10	17	12	15
Grip					
Right	17	21	23	16	25
Left	12	14	15	8	16

TABLE 212

PHYSICAL TESTS: SCALE OF AVERAGE PERCENTILE RANKS

Girls

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	36.6	35.7	36.7	37.4	40.0	25.5	25.4	26.9	27.6	30.6
20	46.0	43.6	45.0	46.0	50.7	31.5	31.0	33.6	35.4	37.9
30	50.5	49.4	49.6	50.2	52.3	35.3	35.2	38.8	41.0	43.5
40	54.9	54.4	55.1	54.6	54.0	39.9	40.5	43.9	45.8	47.6
50	58.7	58.4	59.4	58.5	56.5	44.5	44.1	48.6	48.9	51.4
60	62.9	62.8	63.7	62.4	62.5	48.6	47.8	52.9	53.8	55.0
70	67.6	67.3	67.5	66.6	67.8	52.2	52.7	57.1	59.1	61.3
80	72.1	72.4	70.7	71.6	70.3	57.8	58.2	62.1	64.9	66.2
90	77.8	78.1	76.9	77.7	75.0	65.0	64.7	69.8	70.1	71.1
No. of Cases . .	333	253	230	159	70	328	280	293	237	175
Median	58.7± .7 P.E.	58.4± .9 P.E.	59.4± .9 P.E.	58.5±1.0 P.E.	56.5±1.3 P.E.	44.5± .8 P.E.	44.1± .8 P.E.	48.6± .9 P.E.	48.9±1.0 P.E.	51.4±1.1 P.E.
Q	10.8	11.2	10.9	10.5	8.8	10.8	11.2	11.7	11.9	11.6

TABLE 213

PHYSICAL TESTS: DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES OF AVERAGE PERCENTILE RANK (X-M)

Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	11.1	10.3	9.8	9.8	9.4
20	14.5	12.6	11.4	10.6	12.8
30	15.2	14.2	10.8	9.2	8.8
40	15.0	13.9	11.2	8.8	6.4
50	14.2	14.3	10.8	9.6	5.1
60	14.3	15.0	10.8	8.6	7.5
70	15.4	14.6	10.4	7.5	6.5
80	14.3	14.2	8.6	6.7	4.1
90	12.8	13.4	7.1	7.6	3.9

The tables giving the ranks of the physical tests for girls and the differences between school and working girls show an initial superiority of school girls in every factor except size. The differences in height and weight between school girls and working girls are so small and so irregular that we can only conclude that there are no significant differences.

In the tests of physical skill, the general course of events is the same as for the boys. In steadiness, rapidity of tapping, and card-sorting, the working girls gain somewhat upon the school girls between the ages of fourteen and eighteen. In steadiness, as in the case of the boys, the gain is so great that the working girls are as much superior at eighteen as they were inferior at fourteen. In rapidity of motion and card-sorting, the school girls retain a marked superiority at eighteen. The course of events with regard to vital capacity and strength also corresponds in general to that found among boys. In those two capacities school girls also not only maintain but increase their lead over working girls from fourteen to eighteen.

The percentile scales of average percentile ranks in physical tests for school (X) and working (M) girls separately are given in Table 212. The differences between the scale for school girls and that for working girls is given in Table 213. Although the degree of difference between the two groups is less than in the case of the boys, the general tenor of the relationship is the same. School girls are superior in physical skill at every age, but their superiority is less at eighteen than it was at fourteen. The differences tend to be greatest in the upper part of the scale at fourteen and fifteen, but greatest in the lower part of the scale at seventeen and eighteen. The interpretation is the same as for the boys. Working girls as a class develop more slowly than school girls. School girls at fourteen and fifteen are nearer their adult capacity than working girls. In the years from fifteen to eighteen, working girls go through a period of more rapid approach to adult capacity which means a closer approach to the standards of school girls, particularly in the upper ranges of the scale. By eighteen years there is little difference between the average physical skill of superior school girls and superior working girls.

Factors Which Might Be in Part Responsible for Differences in Physical Measurements between Working and School Children

Before entering upon a summary and interpretation of the physical differences between working children and school children, the extent to which these differences were modified either by the introduction of a new group of school children at sixteen years or by the omissions from year to year must be discussed. The average percentile ranks in physical tests were summed up separately for the X_1 and X_2 series of both sexes. (For table of differences see Chapter XII.) In the case of the boys the median difference is 1.5 percentiles in favor of X_1 at sixteen years, 4.4 percentiles in favor of X_2 at seventeen years, and 0.4 percentiles in favor of X_2 at eighteen years. The differences between the two percentile scales are in general small and inconsistent. The trend is toward a slight superiority of the boys of the X_2 series. All of the differences are small as compared with those between working and school boys (see Table 209). In the case of the girls the median differences are 0.4 percentiles in favor of X_2 at 16 years, 2.3 percentiles in favor of X_1 at seventeen years, and 0.8 percentiles in favor of X_2 at eighteen years. For the girls also the percentile differences between X_1 and X_2 are inconsistent, and small as compared with the differences between school girls and working girls (see Table 213). We may conclude,

TABLE 214 — DISTRIBUTIONS: OMISSIONS — PHYSICAL TESTS AVERAGE PERCENTILE RANK, X ON X SCALE, M ON M SCALE

Boys

YEAR 15

PERCENTILES	X					M				
	Grade V	Grade VI	Grade VII	Grade VIII	Total	Grade V	Grade VI	Grade VII	Grade VIII	Total
10 . . .	9	5		2	16	1				1
20 . . .	4	6	2	1	13	2	2	1		5
30 . . .	5	5	7	2	19	1	2		1	4
40 . . .	1	7	2		10	2	1			3
50 . . .	5	5	7		17	1	3	1		5
60 . . .	3	4	1	1	9	2	4			6
70 . . .	1	2	3		6	2	1			3
80 . . .	2	2	6	4	14	1	1		3	5
90 . . .	1	5	12	4	22	1	2		2	5
100 . . .	4	3	1	1	9	1	2		3	6
	35	44	41	15	135	14	18	2	9	43
Median .					47					58

YEAR 16

PERCENTILES	X					M				
	Grade V	Grade VI	Grade VII	Grade VIII	Total	Grade V	Grade VI	Grade VII	Grade VIII	Total
10 . . .	4	5	1	1	11	1	1			2
20 . . .	8	5	2		15	3	1	2		6
30 . . .	6	5	7	1	19	3	2	1		6
40 . . .	3	4	2	1	10	2	2	1		5
50 . . .	5	5	4		14	3		2		5
60 . . .	4	7	4	2	17	2	1	2		5
70 . . .	2	5	3	4	14	4	1			5
80 . . .	1	2	5	2	10	1	1	5		7
90 . . .	3	2	2	6	13	2	1	3		6
100 . . .	1	1	1	1	4	1		2	1	4
	37	41	31	18	127	22	10	18	1	51
Median .					47					55

TABLE 214—*Continued*

YEAR 17

10 . . .	4	2	5	3	14	5	5	2		12
20 . . .		1	1	2	4	3	2	1		6
30 . . .	2		1	4	7	1	5	1		7
40 . . .		2	1		3	2	1	1	1	5
50 . . .	1		1	2	4	2	1	2	3	8
60 . . .	1		2	8	11	1	3			4
70 . . .			1	4	5	2	1	2		5
80 . . .		5	4	4	13	3		3	2	8
90 . . .				1	1		1	2	1	4
100 . . .				5	5		3	1		4
	8	10	16	33	67	19	22	15	7	63
Median .					53					44

YEAR 18

10 . . .		6	3	3	12	2	1	1		4
20 . . .	2	3	2	3	10	1	2	1		4
30 . . .		2	3	3	8	1	4	1	1	7
40 . . .	1	1		8	10			1	1	2
50 . . .			1	6	7	1	1		1	3
60 . . .	2	2	5	9	18					
70 . . .		1	4	6	11	1			1	2
80 . . .				7	7	2	1		1	4
90 . . .		2	5	10	17	4		1	1	6
100 . . .		1		7	8		3	2		5
	5	18	23	62	108	12	12	7	6	37
Median .					55					48

therefore, that the introduction of the X_2 series at sixteen years has not materially modified the comparison of school and working children.

A second factor which may have modified the relation of the two groups from year to year is that of losses by omission. A table of omissions, based on the percentile rank in the last annual test given (Table 214), shows that the omissions from year to year in the case of boys were fairly evenly distributed throughout the scale in both groups. The median of the group of school boys lost from the series is a few points below the median of all school boys at fifteen and at sixteen, but a trifle above the school median at seventeen and at eighteen. Among working boys the group lost at fifteen and at sixteen had medians very slightly above the median of working boys, while at seventeen and eighteen their medians were below the general median of working boys. The omission of a group whose medians were as close to those of the whole group as these could account for but a small portion of the total group differences. The next point to consider is whether the omissions might account for the fact that the two groups tend to approach one another from year to year. The effect of the omissions would be to enhance somewhat the difference between working and school boys at fifteen and sixteen, but to reduce it at seventeen and eighteen. At least part of the tendency of the two groups to approach one another is thus seen to be due to the omissions. It would require a more laborious additional analysis than it has been possible to undertake to determine how much of it. Since the tendency cannot be thus accounted for in the case of the girls and the trend of events is so similar in the two sexes, the presumption is that the phenomenon in the case of the boys, too, is not the mere result of selection but is related to laws of growth and development.

TABLE 215

DISTRIBUTIONS: OMISSIONS — PHYSICAL TESTS
AVERAGE PERCENTILE RANK, X ON X SCALE, M ON M SCALE

Girls

YEAR 15

PERCENTILES	X					M				
	Grade V	Grade VI	Grade VII	Grade VIII	Total	Grade V	Grade VI	Grade VII	Grade VIII	Total
10 . . .	6		1		7	2	3	2		7
20 . . .	3	2	2	1	8		2			2
30 . . .	2	2	1		5	3				3
40 . . .	2	2	4		8		1	1	2	4
50 . . .	1	4	5		10	1	2	1		4
60 . . .	4	1	3		8	1		1	1	3
70 . . .	3	5	4	1	13					
80 . . .	1	1	1		3	1	2		2	5
90 . . .	2	1	2	4	9		2	4	3	9
100 . . .	1	1	2	1	5	1		2	3	6
	25	19	25	7	76	9	12	11	11	43
Median .					51					58

YEAR 16

PERCENTILES	X					M				
	Grade V	Grade VI	Grade VII	Grade VIII	Total	Grade V	Grade VI	Grade VII	Grade VIII	Total
10 . . .	3	2	5		10		2	1		3
20 . . .	2	2	2	1	7					
30 . . .	3	4			7		1			1
40 . . .	2	8	4		14	1	1			2
50 . . .	3	5	3	1	12					
60 . . .	2	7	5	1	15	1	1		3	5
70 . . .	1	2	4		7		1			1
80 . . .	2	6	6	1	15			1	2	3
90 . . .		7	3	2	12	1		2	1	4
100 . . .		4	1	1	6					
	18	47	33	7	105	3	6	4	6	19
Median .					53					59

The table of omissions for girls (Table 215) shows no regular trend. The medians of the group of girls lost each year do not vary widely from the median of the whole group, either school or working. At fifteen and sixteen the group of school girls lost have medians of 51 and 53—very close to the general median. The group of working girls have medians of 58 and 59—a few points above the median of all working girls. At seventeen the losses from both groups had medians somewhat below average—47 and 45. At eighteen the school girls lost had a median of 45, and the working girls one of 59. The withdrawal of groups whose median was as close to that of the entire group as these could not account for group differences of the magnitude of those found between working girls and school girls. It remains to inquire whether they are of such a nature as to account, in part or in whole, for the apparent approach to one another of working and school girls with successive years. A consideration of the nature of the losses at successive years shows that since the working girls at fifteen and sixteen lost more superior members than the school girls, the omissions tend to enhance the differences. They would have been somewhat smaller during

TABLE 215—*Continued*

YEAR 17

10 . . .	6	3	1	1	11	1	3	3		7
20 . . .	1	2	2	1	6	5	3	2		10
30 . . .	4	4	2	1	11	4	2		1	7
40 . . .		1			1	2	1	1		4
50 . . .	2	1	3	1	7		1	2	2	5
60 . . .	1	2	1		4		2		1	3
70 . . .	1	3	2	2	8		3	1	3	7
80 . . .	1	1	3	1	6	2	1		2	5
90 . . .			1	4	5	2	1	3	1	7
100 . . .	1	2	1	2	6			2	2	4
	17	19	16	13	65	16	17	14	12	59
Median .					47					45

YEAR 18

10 . . .	1	3	2	3	9		2	1		3
20 . . .		3		5	8	2	2	1		5
30 . . .	1		1	6	8	2	2			4
40 . . .		2	1	9	12	4	1			5
50 . . .				7	7		3	2	1	6
60 . . .		1		3	4	1	3	2		6
70 . . .		1	1	4	6		2	1	1	4
80 . . .		1	1	7	9	1	2	1	3	7
90 . . .				6	6	1		3	1	5
100 . . .			1	9	10		5	3	2	10
	2	11	7	59	79	11	22	14	8	55
Median .					45					59

these years had there been no omissions. At seventeen the losses from the two groups had virtually the same rank, and would for this reason have little bearing on group differences. At eighteen the working girls again lost more of their superior members than the school girls, showing that the effect of elimination is to make the group difference appear larger than it would otherwise have been. If there had been no omissions, then, the group differences between working and school girls would have been somewhat smaller than those of the present scales, but the tendency of the two groups to approach one another from fourteen to eighteen years would have been the same. We can safely conclude that in the case of the girls omissions play no part in accounting for the fact that school girls and working girls show less difference of physical ability at eighteen years than they had at fourteen.

SUMMARY OF SECTION I

I. In general, school children are superior to working children in every physical measurement except that of steadiness at seventeen and eighteen years.

II. School children as a group reach physical maturity earlier than working children. In most measures, the period of rapid yearly gain stops a year earlier for school children than for working children. In the case of boys, in most of the measures, school boys make large yearly gains up to sixteen years and working boys up to seventeen years. The same difference is observable in the measurements of girls, though it is not quite so clear and consistent. Girls mature earlier than boys. In most instances school girls have completed their period of rapid yearly gain in physical capacities by fourteen or fifteen and working girls by sixteen or seventeen.

III. Because of the difference noted in II in age of maturity, working children differ less from school children in physical capacity at eighteen years than they did at fourteen years.

IV. The results scarcely justify us in drawing conclusions about the effect of industrial life on physical growth and development. Since school children are at every age superior, the presumption is, of course, in favor of school life as a background for physical development, but since the difference between the two groups was even greater at fourteen before either group had entered industry than at eighteen after four years of industrial life for one group and four years of school life for the other, we are not justified in attributing the inferiority of working children to the effect of industry on them.

V. The only two physical measures in which school children—both boys and girls—are more superior to working children at eighteen years than they were are fourteen years are vital capacity and strength. One might hazard a guess that high-school athletics tend to train vital capacity and strength, whereas the factory work in which over half of the working group were engaged tends to train rapidity, steadiness, and coördination of eye and hand.

It is also possible that strength and vital capacity are to be regarded as indices of general physical vigor rather than as capacities which have been acquired by training. Steadiness, in which the working group excelled, is not clearly related to the life experiences of either group. One would be apt to interpret it as dependent upon stability—or perhaps lack of irritability—of the nervous system. Certain it is that the school children seemed more alert and responsive than the working children. It was easier to arouse interest and call forth effort among them. Perhaps a greater degree of stolidity may account for the superiority in steadiness of older working children. The two tests of speed—tapping and card-sorting—seem more clearly related to training than any of the others. Half or more of the working group were employed in some type of factory work in which speed of motion and speed of coördination were demanded.

VI. Left-handedness is more frequently found among working than among school children of both sexes. It tends to decrease from year to year from fourteen to eighteen years. The proportion of left-handedness is for all groups greatest in terms of strength, next greatest in terms of steadiness, and least in terms of rapidity of motion. The degree of superiority of the right hand over the left is greater among school than among working children.

SECTION II: MENTAL MEASUREMENTS

Cancellation

The ten-percentile scales in cancellation, index and accuracy, for school boys (X) and working boys (M) are given in Tables 216 and 217. The differences between the scale for school boys and that for working boys are given in Tables 218 and 219. The fact that different letters which proved to vary in difficulty (see Chapter IV) were used in different years renders the comparison from year to year somewhat complicated. This much is evident at a glance: School boys are superior to working boys, both in index and in accuracy, at every age and regardless of the letter used. At fourteen years the advantage of the school boys is large in accuracy but small in index.

This means that they sacrificed speed somewhat to accuracy, as compared with working boys. Their superiority then, at fourteen years, lies in better accuracy rather than in greater speed. From fourteen years on, the advantage of the school boys is small in accuracy but relatively large in index. In the years from fifteen on to eighteen, then, the superiority of the school boys is chiefly in their superior speed. This seems to be on the whole increasingly true from year to year. At eighteen the difference in accuracy is negligible, but the difference in index is considerable.

In general, the course of events from year to year is as follows: The superiority of the school boys in accuracy decreases from year to year. It is far less at eighteen than it was at fourteen. The difference may have to do with the superior ability of the school boys to react adequately to a *new* situation. The superiority in index is greatest at fifteen years. It then decreases to seventeen years and increases again at eighteen. In other words, the school boys gain in speed enormously more rapidly than the working boys between fourteen and fifteen years. Between fifteen and

TABLE 216

CANCELLATION — INDEX IN SECONDS

Boys

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	774.0	427.1	220.1	425.6	240.0	726.9	354.4	425.0	348.4	294.8
10	315.3	205.0	234.1	249.3	181.6	342.0	239.0	262.1	263.1	190.7
20	275.2	186.2	210.5	210.8	156.4	286.2	222.6	233.6	232.0	179.6
30	251.7	172.6	195.9	194.8	145.3	259.4	208.3	216.3	213.9	166.8
40	233.5	161.2	184.6	184.9	136.4	237.9	195.0	201.9	197.9	156.2
50	218.7	151.9	174.8	175.9	129.5	220.2	182.6	191.4	186.9	147.9
60	201.2	142.8	165.8	168.5	122.5	206.3	171.8	180.7	176.4	139.5
70	191.4	134.3	156.4	161.6	116.4	193.5	161.4	170.9	165.5	131.4
80	177.7	126.2	146.3	152.9	110.6	179.7	149.8	161.1	154.3	123.2
90	160.6	115.5	133.7	140.3	104.9	162.4	136.5	147.3	142.4	110.8
U. L.	100.0	92.0	113.7	98.0	96.0	113.8	105.1	104.0	93.6	89.0
No. of Cases . .	426	292	283	173	66	417	384	346	299	291
Median	218.7±2.2 P. E.	151.9±1.8 P. E.	174.8±1.9 P. E.	175.9±2.1 P. E.	129.5±2.9 P. E.	220.2±2.6 P. E.	182.6±1.9 P. E.	191.4±2.0 P. E.	186.9±2.3 P. E.	147.9±1.7 P. E.
Q	37.0	24.6	25.9	22.8	18.7	43.1	30.0	29.5	31.6	23.0

seventeen years the working boys gain speed faster than the school boys. Between seventeen and eighteen, the gain is greater for the school group. The course of events is very similar to that observed in physical capacities. The period of very rapid yearly gain is complete for school boys at fifteen. Beyond that age, working boys gain in speed from year to year

TABLE 217 — CANCELLATION — ACCURACY IN PERCENTS

Boys

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	44.0	70.0	50.0	70.6	80.6	19.0	50.0	32.0	54.0	58.6
10	74.1	88.1	81.5	86.3	91.9	54.8	77.0	77.2	81.9	90.7
20	80.5	91.5	87.5	90.3	95.7	66.7	87.2	83.8	87.3	93.2
30	84.8	93.8	90.6	93.0	96.2	74.9	90.2	87.0	90.2	95.6
40	87.7	95.8	93.0	95.5	96.8	78.3	92.5	89.2	92.2	96.2
50	90.2	96.6	95.3	96.3	97.3	83.3	94.8	91.3	94.3	96.8
60	92.7	97.4	96.4	97.0	97.8	87.1	96.3	93.2	95.9	97.5
70	95.1	98.2	97.3	97.8	98.4	89.6	97.4	95.1	96.9	98.1
80	97.0	99.0	98.1	98.6	98.9	93.7	98.4	96.8	97.9	98.7
90	98.8	99.8	99.1	99.2	99.5	97.5	99.5	98.4	99.0	99.4
U. L.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Cases	429	293	288	175	67	420	388	346	303	291
Median	90.2±.4 P. E.	96.6±.2 P. E.	95.3±.3 P. E.	96.3±.3 P. E.	97.3±.2 P. E.	83.3±.6 P. E.	94.8±.3 P.E.	91.3±.4 P. E.	94.3±.3 P. E.	96.8±.2 P. E.
Q	6.7	3.0	4.3	3.6	1.4	10.5	4.6	5.4	4.5	2.0

TABLE 218 — CANCELLATION — INDEX: DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	26.7	34.0	28.0	13.8	9.1
20	11.0	36.4	23.1	21.2	23.2
30	7.7	35.7	20.4	19.1	21.5
40	4.4	33.8	17.3	13.0	19.8
50	1.5	30.7	16.6	11.0	17.4
60	5.1	29.0	14.9	7.9	17.0
70	2.1	27.1	14.5	3.9	15.0
80	2.0	23.6	14.8	1.4	12.6
90	1.8	21.0	13.6	2.1	5.9

more than school boys do, up to seventeen years. The period of steady though slower improvement continues with the school boys up to eighteen, and gives them more of a lead over working boys at eighteen than they had at seventeen. To test whether or not the sixteen-year differences were seriously modified by the introduction of a new and unpracticed set of boys

TABLE 219 — CANCELLATION — ACCURACY: DIFFERENCES IN PERCENTS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	19.3	11.1	4.3	4.4	1.2
20	13.8	4.3	3.7	3.0	2.5
30	9.9	2.6	3.6	2.8	.6
40	9.4	3.3	3.8	3.3	.6
50	6.9	1.8	4.0	2.0	.5
60	5.6	1.1	3.2	1.1	.3
70	5.5	.8	2.2	.9	.3
80	3.3	.6	1.3	.7	.2
90	1.3	.3	.7	.2	.1

TABLE 220 — CANCELLATION — INDEX IN SECONDS

Girls

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	948.0	301.9	220.1	286.0	240.0	521.5	402.4	396.0	547.0	260.0
10	297.6	186.6	223.0	212.5	173.2	304.0	206.5	230.1	215.1	170.6
20	263.7	170.1	200.0	195.0	154.5	251.3	184.8	208.9	192.9	155.1
30	242.4	157.9	183.0	184.6	144.9	228.1	171.1	192.7	178.7	145.2
40	224.4	149.4	174.1	172.3	133.6	210.9	159.3	178.2	162.6	135.6
50	208.0	141.0	164.4	163.8	128.4	195.2	150.8	167.1	157.1	126.6
60	193.5	133.3	156.0	154.3	112.8	182.3	142.2	158.5	148.8	117.8
70	180.4	125.7	146.0	145.0	105.1	170.2	133.9	146.9	140.6	109.9
80	161.9	117.0	136.0	136.0	90.1	157.9	125.8	136.5	129.7	101.9
90	143.7	106.8	124.2	122.2	80.1	143.7	113.7	124.2	117.4	95.1
U. L.	89.5	88.7	109.2	81.2	76.0	111.5	84.1	87.5	87.2	80.1
No. of Cases	327	254	235	160	77	322	278	289	239	199
Median	208.0±3.0 P. E.	141.0±1.9 P. E.	164.4±2.0 P. E.	163.8±2.3 P. E.	128.4±4.1 P. E.	195.2±2.1 P. E.	150.8±1.8 P. E.	167.1±2.2 P. E.	157.1±2.0 P. E.	126.6±2.0 P. E.
Q	40.7	23.8	25.3	24.7	28.6	37.8	24.1	29.6	2.0	22.2

(X$_2$), the percentiles for index of X$_1$ and X$_2$ were worked out separately. The median difference between the two was 4.2 seconds in favor of X$_2$. The X$_2$ series thus tends to increase slightly, rather than to decrease, the sixteen-year difference between school and working boys.

There is more difference between inferior school boys and inferior working boys in this capacity than between superior ones. This trend is the same as that for card-sorting, but the reverse of that in the other physical measurements.

Among girls, the differences between school and working groups are much less striking than among boys, but the general trend of events is similar. The percentile scales appear in Tables 220 and 221, and the differences in Tables 222 and 223. In accuracy, school girls have a large advantage at fourteen, which tends to become less with successive years, and is least of all at eighteen. In index, the working girls have the advantage at fourteen and again to a less degree at seventeen years. At fourteen, then, the school girls, like the boys, sacrificed speed to accuracy as compared with working girls. Between fourteen and fifteen the school girls, like the boys, gained far faster than the working group in speed, and were superior in index at fifteen, while the working girls gained more in accuracy

TABLE 221 — CANCELLATION — ACCURACY IN PERCENTS

Girls

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	27.5	72.0	42.0	58.0	80.6	30.8	52.0	45.1	46.0	70.6
10	72.7	87.2	81.2	86.3	92.0	56.4	83.9	75.6	76.9	90.8
20	78.6	90.8	87.3	91.2	95.3	65.2	88.5	82.9	84.2	93.4
30	83.5	92.8	90.4	94.0	96.0	73.9	91.8	86.3	87.6	95.8
40	87.2	94.9	93.0	95.9	96.6	78.1	95.0	89.1	90.0	96.4
50	89.6	96.2	95.5	96.5	97.2	81.6	96.3	91.4	92.0	96.9
60	92.0	97.1	96.4	97.3	97.7	85.0	97.1	93.6	93.8	97.6
70	94.4	98.0	97.3	97.9	98.3	88.5	98.0	95.7	95.6	98.2
80	96.6	98.8	98.2	98.7	98.9	92.0	98.9	97.2	97.1	98.8
90	98.6	99.7	99.1	99.3	99.4	95.4	99.7	98.6	98.6	99.4
U. L.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Cases	328	255	236	164	77	327	279	294	242	199
Median	89.6± .5 P.E.	96.2± .2 P.E.	95.5± .4 P.E.	96.5± .3 P.E.	97.2± .2 P.E.	81.6±1.3 P.E.	96.3± .3 P.E.	91.4± .4 P.E.	92.0± .4 P.E.	96.9± .2 P.E.
Q	7.2	3.3	4.0	3.2	1.5	19.4	4.2	6.1	5.4	2.0

and were practically equal to the school girls. At sixteen and seventeen years the school girls maintain a superiority in accuracy, but the working girls approach and at seventeen surpass them in index. At eighteen the difference between the two groups is least of all. The school girls have a slight advantage in both index and accuracy. The rapid gain in speed for the school group between fourteen and fifteen is characteristic of both girls and boys. In both sexes, the superiority in index is greatest at fifteen. In both sexes, the working group gains in index faster than the school group between the ages of fifteen and seventeen, while the gain between seventeen and eighteen is greater for the school group. To test the extent to which the introduction of a new group of unpracticed girls (X_2) at sixteen years modified the situation, percentile scales were worked out separately for X_1 and X_2. As in the case of the boys, the X_2 girls proved slightly superior—their median percentile was 3 seconds better than that of X_1. Their effect, therefore, was to enhance slightly the superiority of the school group.

TABLE 222 — CANCELLATION — INDEX: DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	6.4	19.9	7.1	2.6	− 2.6
20	−12.4	14.7	8.9	−2.1	.6
30	−14.3	13.2	9.7	−5.9	.3
40	−13.5	9.9	4.1	−9.7	2.0
50	−12.8	11.8	2.7	−6.7	− 1.8
60	−11.2	8.9	2.5	−5.5	5.0
70	−10.2	8.2	.9	−4.4	4.8
80	4.0	8.8	.5	−6.3	11.8
90	.0	6.9	.0	−4.8	15.0

TABLE 223 — CANCELLATION — ACCURACY: DIFFERENCES IN PERCENTS BETWEEN TEN-PERCENTILE SCALES (X-M)

Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	16.3	3.3	5.6	9.4	1.2
20	13.4	2.3	4.4	7.0	1.9
30	9.6	1.0	4.1	6.4	.2
40	9.1	−.1	3.9	5.9	.2
50	8.0	−.1	4.1	4.5	.3
60	7.0	.0	.8	3.5	.1
70	5.9	.0	1.6	2.3	.1
80	4.6	−.1	1.0	1.6	.1
90	3.2	.0	.5	.7	.0

SUBSTITUTION

The ten-percentile scales for boys in the various elements of the substitution test, for school (X) and working (M) boys separately, are given in Tables 224 to 226. The differences between the percentiles of the school boys (X) and those of the working boys (M) are shown in Tables 227 to 229. In interpreting these tables it is necessary to remember that at fourteen and fifteen the test was given with three practice pages made out from the key and the fourth page from memory, while at sixteen, seventeen, and eighteen it was given with two practice pages made out from the key and a third page from memory (see Chapter IV). The accuracy reached on the practice pages was of so high an order and differed so little from group to group, that it was not worth while to take it into consideration except as it determined the index. The percentiles for accuracy on the three practice pages at years fourteen and fifteen were worked out. The percentile differences in the greater part of the two series are only a fraction of a point on the scale. In the lower half of the fourteen-year scales there is a difference in favor of school boys on each of the three pages. At the ten-percentile level it amounts to 7.4 points on page 1, 3.1 points on page 2, and 2.1 points on page 3. At fifteen the difference even at the ten-percentile level is only 2.4 points. Differences in index thus seem to be primarily differences of speed and only to a very slight extent differences of accuracy. On the memory page, however, accuracy, which measures the perfection of learning after an amount of practice which was constant, is of significance. The amount of practice given proved to be so great that the majority of subjects in both groups reached a high degree of accuracy. It is interesting to note that while the difference in accuracy of memory between school boys and working boys is slightly in favor of the working boys at fourteen, it gradually shifts in favor of the school boys until at eighteen the difference is greater than at any other year and is in favor of the school group.

The significant measure of the test is that of index, in which speed of performance is the chief determining factor. A glance at the table of differences shows that the school boys are superior in every element of the test. The differences between school and working boys are greater at eighteen than they were at fourteen. Between fourteen and fifteen the school boys gain more than the working boys, while between fifteen and sixteen the working boys gain much more than the school boys. After sixteen the difference in favor of the school group gradually increases and at eighteen is greater than it was at fourteen, though not quite so large as the fifteen-year differences. Interpreted in relative rates of growth, this means that the school children complete their period of most rapid improvement in this type of performance at fifteen, while the working group continues to sixteen. Since the X_2 boys proved to have a slightly better record

TABLE 224 — SUBSTITUTION — INDEX IN SECONDS

Boys

PRACTICE PAGE 1

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	285.0	227.6	244.2	198.0	180.0	400.0	286.0	254.6	248.6	477.2
10	199.0	169.6	159.4	153.3	139.0	227.5	205.8	181.1	182.9	176.1
20	181.4	153.1	147.5	138.4	128.0	208.1	186.2	161.4	163.6	159.0
30	171.7	141.0	136.8	131.6	118.8	195.0	174.6	153.2	153.6	150.9
40	162.7	134.8	128.2	124.8	114.0	183.7	165.8	145.9	145.5	142.8
50	154.6	129.2	119.7	118.2	109.4	172.7	157.3	138.8	138.4	135.5
60	146.8	123.6	114.0	112.4	104.6	161.9	149.6	132.7	131.6	128.5
70	138.9	117.4	108.3	106.8	99.8	151.9	141.7	126.5	125.2	121.6
80	129.1	110.1	102.6	101.0	92.0	142.0	132.3	120.4	118.0	113.8
90	118.8	101.6	92.6	91.0	84.0	129.4	122.4	107.3	108.0	105.7
U. L.	102.9	82.2	75.0		69.8	71.0	82.2	69.6	78.2	100.0
No. of Cases	423	295	285	175	66	340	382	347	309	304
Median	154.6±1.3 P. E.	129.2±1.2 P. E.	119.7±1.4 P. E.	118.2±1.5 P. E.	109.4±1.8 P. E.	172.7±1.8 P. E.	157.3±1.4 P. E.	138.8±1.2 P. E.	138.4±1.2 P. E.	135.5±1.0 P. E.
Q	21.3	16.7	18.4	15.6	11.7	27.3	21.7	16.9	18.5	13.7

PRACTICE PAGE 2

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	211.8	185.0	277.1	178.0	180.0	378.0	241.3	260.2	221.7	209.1
10	159.2	135.2	138.7	131.6	114.4	184.8	168.6	153.9	150.6	152.2
20	145.7	122.9	125.1	117.8	104.0	165.2	151.4	128.7	135.1	135.7
30	135.4	114.1	114.3	109.8	97.2	151.4	139.9	125.5	125.9	125.2
40	127.3	106.3	105.4	101.4	93.0	139.5	131.8	121.9	117.9	116.8
50	119.4	97.1	97.9	96.0	88.4	133.2	123.7	114.1	112.0	110.4
60	112.6	91.6	92.8	91.2	83.8	126.9	115.9	106.5	106.1	104.0
70	105.7	88.0	87.6	86.2	78.9	120.6	108.4	98.9	100.2	97.3
80	100.5	82.6	82.4	81.4	70.4	110.4	100.8	91.2	91.2	89.8
90	87.0	73.0	72.7	71.6	62.0	99.8	88.5	83.5	82.0	82.3
U. L.	66.6	53.1	55.0		47.0	68.5	55.0	50.2	62.0	47.0
No. of Cases	425	295	287	175	67	347	381	347	307	303
Median	119.4±1.1 P. E.	97.1±1.2 P. E.	97.9±1.3 P. E.	96.0±1.4 P. E.	88.4±1.6 P. E.	133.2±1.5 P. E.	123.7±1.3 P. E.	114.1±1.1 P. E.	112.0±1.0 P. E.	110.4±1.3 P. E.
Q	18.8	16.6	17.4	15.0	10.3	21.4	20.6	16.0	17.4	18.5

TABLE 224—*Continued*

PAGE 3

PERCENTILES	X					M				
	PRACTICE PAGE 3		MEMORY PAGE 3			PRACTICE PAGE 3		MEMORY PAGE 3		
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	194.5	217.7	427.6	448.0	415.0	276.4	355.5	1749.0	1476.0	635.0
10	145.3	122.2	177.5	188.6	143.0	165.5	156.9	244.0	226.6	214.2
20	129.9	112.0	136.2	144.4	114.0	145.9	138.9	181.8	15.7	160.9
30	118.6	103.2	113.7	122.4	101.5	133.6	127.8	149.3	127.6	136.2
40	112.3	96.5	99.6	104.5	86.4	124.0	117.9	118.3	113.2	119.4
50	106.9	90.9	91.8	92.9	76.8	115.9	110.7	108.5	102.1	105.2
60	99.5	85.4	84.0	85.7	70.7	108.7	103.6	98.7	93.1	93.5
70	92.3	79.8	76.3	79.4	66.5	101.6	96.0	89.6	85.7	85.0
80	85.2	72.5	68.7	69.2	62.6	92.5	88.0	80.5	78.8	77.5
90	75.7	65.3	61.2	62.5	56.2	82.8	80.1	70.3	71.2	69.0
U. L.	57.0	49.0	50.0	36.5	47.0	59.4	54.0	52.3	40.4	47.0
No. of Cases .	427	294	284	173	67	339	383	334	307	303
Median	105.9±1.1 P. E.	90.9±1.2 P. E.	91.8±2.0 P. E.	92.9±2.7 P. E.	76.8±3.4 P. E.	115.9±1.1 P. E.	110.7±1.4 P. E.	108.5±2.8 P. E.	102.1±2.1 P. E.	105.2±2.4 P. E.
Q	17.8	16.0	26.3	30.0	21.6	16.4	20.7	40.3	30.3	33.7

MEMORY PAGE 4

PERCENTILES	X		M	
	14 yrs.	15 yrs.	14 yrs.	15 yrs.
L. L.	884.0	464.1	1257.6	906.5
10 . .	203.1	157.9	226.0	238.5
20 . .	152.7	122.7	162.3	163.2
30 . .	128.2	108.2	137.1	131.7
40 . .	112.5	97.2	121.0	114.7
50 . .	100.9	86.7	111.2	104.9
60 . .	93.8	81.0	101.9	96.1
70 . .	87.1	75.7	93.6	88.3
80 . .	80.4	68.7	85.6	80.5
90 . .	69.5	62.7	75.1	69.6
U. L.	56.4	47.0	53.0	52.6
No. of Cases	423	292	337	378
Median	100.0±2.9 P.E.	86.7±2.9 P. E.	111.2±3.8 P. E.	104.9±4.0 P.E.
Q . .	47.5	34.5	52.3	58.3

TABLE 225 — SUBSTITUTION — INDEX

Boys

SUM OF PRACTICE PAGES

PERCENTILES	X					M				
	PAGES 1, 2, 3		PAGES 1, 2			PAGES 1, 2, 3		PAGES 1, 2		
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	672	630	424	351	350	1088	855	557	470	614
10	494	387	295	270	227	541	513	358	331	317
20	447	374	265	251	223	499	468	299	298	291
30	423	357	245	239	214	472	439	282	281	273
40	402	339	231	227	205	449	415	268	265	254
50	382	321	219	217	196	421	393	255	251	242
60	364	306	208	206	188	400	371	241	239	230
70	346	291	196	195	180	379	355	228	233	219
80	328	274	186	184	169	352	333	215	217	208
90	295	254	171	170	154	318	307	202	199	193
U. L.	206	197	109	149	121	201	219	120	161	121
No. of Cases . .	418	293	286	172	66	349	377	346	305	304
Median	382±3.0 P. E.	321±3.0 P. E.	219±2.3 P. E.	217±2.5 P. E.	196±3.4 P. E.	421±4.0 P. E.	393±3.8 P. E.	255±2.6 P. E.	251±2.8 P. E.	242±2.4 P. E.
Q	49	41.5	32	27.6	22.0	60	54.8	34.5	39.5	34.3

TABLE 226 — SUBSTITUTION — ACCURACY IN PERCENTS

Boys

PERCENTILES	X					M				
	MEMORY PAGE 4		MEMORY PAGE 3			MEMORY PAGE 4		MEMORY PAGE 3		
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	30.0	56.0	24.0	49.4	48.0	28.0	24.0	18.0	20.0	26.0
10	69.7	76.4	73.0	73.0	77.8	70.8	67.4	68.8	71.9	73.7
20	80.7	84.9	82.9	83.3	88.8	82.1	84.2	80.1	83.9	82.3
30	87.6	90.4	90.1	90.8	96.7	88.8	91.5	88.0	90.2	89.5
40	93.3	94.6	94.2	95.4	99.0	93.5	95.0	92.6	94.2	94.6
50	96.2	96.9	96.2	98.2	100.0	96.4	96.9	95.3	96.2	98.1
60	97.3	98.1	97.5	99.4	100.0	97.7	98.1	97.0	97.6	99.6
70	98.2	98.6	100.0	100.0	100.0	98.4	98.7	100.0	100.0	100.0
80	98.8	99.1	100.0	100.0	100.0	98.9	99.0	100.0	100.0	100.0
90	99.4	99.5	100.0	100.0	100.0	99.5	99.5	100.0	100.0	100.0
U. L.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Cases . .	425	293	285	174	67	345	384	337	309	304
Median	96.2±.4 P. E.	96.9±.4 P. E.	96.2±.5 P. E.	98.2±.6 P. E.	100 ±.6 P. E.	96.4±.4 P. E.	96.9±.3 P. E.	95.3±.5 P. E.	96.2±.5 P. E.	98.1±.5 P. E.
Q	7.2	6.1	6.8	6.5	3.6	6.6	5.5	8.0	7.0	7.1

TABLE 227 — SUBSTITUTION — INDEX: DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

Percentiles	Practice Page 1					Practice Page 2				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	28.5	36.2	21.7	29.4	37.1	25.6	33.4	15.2	19.0	37.8
20	26.7	33.1	13.9	25.2	31.0	19.5	28.5	3.6	17.3	31.7
30	23.3	33.6	16.4	22.0	32.1	16.0	25.8	11.2	16.1	28.0
40	21.0	31.0	17.7	20.7	28.8	12.2	21.5	16.5	16.5	23.8
50	18.1	28.1	19.1	20.2	26.1	13.8	26.6	16.2	16.0	22.0
60	15.1	26.0	18.7	19.2	23.9	14.3	24.3	13.7	14.9	20.2
70	13.0	24.3	18.2	18.4	21.8	14.9	20.4	11.3	14.0	18.4
80	12.9	22.2	17.8	17.0	21.8	9.9	18.2	8.8	9.8	19.4
90	10.6	20.8	14.7	17.0	21.7	12.8	15.5	10.8	10.4	20.3

Percentiles	Practice Page 3		Memory Page 3			Memory Page 4	
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.
10	20.2	34.7	66.5	38.0	71.2	22.9	80.6
20	16.0	26.9	45.6	13.3	46.9	9.6	40.5
30	15.0	24.6	35.6	5.2	34.7	8.9	23.5
40	11.7	21.4	18.7	8.7	33.0	8.5	17.5
50	10.0	19.8	16.7	9.2	28.4	9.3	18.2
60	9.2	18.2	14.7	7.4	22.8	8.1	15.1
70	9.3	16.2	13.3	6.3	19.5	6.5	12.6
80	7.3	15.5	11.8	9.6	14.9	5.2	11.8
90	7.1	14.8	9.7	8.7	12.8	5.6	6.9

TABLE 228 — SUBSTITUTION — INDEX: DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

SUM OF PRACTICE PAGES

Percentiles	Pages 1, 2, 3		Pages 1, 2		
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	47	126	63	61	90
20	52	94	34	47	68
30	49	82	37	42	59
40	47	76	37	38	49
50	39	72	36	34	36
60	36	65	33	33	42
70	33	64	32	38	39
80	24	59	29	33	39
90	23	53	31	29	39

in index of page 1 at sixteen years than the X_1 group (see Chapter VI), the small rate of gain of school boys between fifteen and sixteen cannot be attributed to the introduction of a new and unpracticed set of boys at sixteen.

In this test, as in the other mental tests so far discussed, the differences between school and working boys are greater in the lower than in the upper part of the scale. In other words, the differences between poor school boys and poor working boys in substitution are greater than the differences between the good ones.

The ten-percentile scales for girls, in the various measures of the substitution test, for school (X) and working (M) girls separately, are presented in Tables 230 to 232. The differences between the percentiles for school (X) and working (M) girls are given in Tables 233 to 235. The course of events is on the whole similar to that found among the boys. The school girls show superiority to the working girls at every age, and in every phase of the test. As in the case of the boys, the difference is primarily one of speed rather than one of accuracy. The percentiles for accuracy of the practice pages at fourteen and fifteen showed conditions similar to that of the boys. The differences between the percentile scales for school girls and working girls were only fractions of a point, except in the lower half of the scale at year fourteen. At the ten-percentile level of year fourteen, school girls were 5.9 points ahead on page 1; 2.5 points ahead on page 2; and 1.3 points ahead on page 3. At fifteen even the ten-percentile difference was only 0.1 of a point. The difference between school and working girls is somewhat less than the difference between school and working boys. As in the case of the boys, the school girls show more superiority to the working girls in

TABLE 229

SUBSTITUTION — ACCURACY: DIFFERENCES IN PERCENTS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

Percentiles	Memory Page 4		Memory Page 3		
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	−1.1	9.0	4.2	1.1	4.1
20	−1.4	.7	2.8	−.6	6.5
30	−1.2	−1.1	2.1	.6	7.1
40	−.2	−.4	1.6	1.2	4.4
50	−.2	.0	.9	2.0	1.9
60	−.4	.0	.5	1.8	.4
70	−.2	−.1	.0	.0	.0
80	−.1	.1	.0	.0	.0
90	−.1	.0	.0	.0	.0

TABLE 230 — SUBSTITUTION — INDEX IN SECONDS

Girls

Practice Page 1

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	481.0	237.7	300.0+	217.0	240.0	419.5	307.8	249.0	248.0	260.0
10	209.4	175.4	163.3	154.8	150.6	217.1	200.6	179.0	182.0	184.1
20	185.9	157.0	143.9	138.8	136.2	192.4	177.0	163.5	165.3	163.2
30	172.8	147.1	135.5	129.8	128.0	179.3	166.2	153.8	154.0	149.2
40	162.8	138.2	129.4	121.2	119.8	170.9	156.6	145.9	144.8	138.5
50	154.2	131.9	123.4	115.0	114.6	162.6	148.6	138.3	137.3	133.0
60	146.1	125.5	118.5	109.0	109.4	154.3	140.5	132.0	131.9	127.6
70	137.7	119.0	111.2	103.2	104.2	146.1	133.8	125.6	126.4	122.1
80	128.7	111.0	105.2	96.6	98.2	136.9	127.1	116.4	120.9	114.2
90	118.6	102.9	97.1	88.1	94.2	125.0	120.3	106.1	108.5	104.7
U. L.	88.0	75.8	72.0	74.0	74.8	83.3	98.4	76.5	86.4	74.4
No. of Cases	329	253	239	162	78	292	285	293	239	199
Median	154.2±1.5 P. E.	131.9±1.5 P. E.	123.4±1.3 P. E.	115.0±1.6 P. E.	114.6±2.1 P. E.	162.6±1.6 P. E.	148.6±1.6 P. E.	138.3±1.4 P. E.	137.3±1.5 P. E.	133.0±1.7 P. E.
Q	22.8	18.6	15.8	16.4	16.0	22.0	20.6	18.9	18.0	19.0

Practice Page 2

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	280.0	195.0	262.5	165.6	472.0	298.4	295.1	273.8	238.6	188.5
10	163.3	140.6	145.9	131.0	130.6	176.1	168.1	157.3	157.6	156.0
20	149.1	125.0	126.9	117.0	113.8	159.0	145.3	139.7	139.1	136.5
30	137.6	115.8	115.4	109.0	103.4	149.0	134.3	130.2	128.4	119.7
40	128.6	109.6	107.5	101.2	97.0	139.1	126.5	120.8	118.7	112.8
50	119.7	103.4	99.8	95.8	92.6	130.4	119.0	114.1	112.6	105.9
60	112.7	97.1	94.5	90.4	88.2	121.8	112.9	107.8	106.6	99.1
70	106.0	90.6	89.2	85.3	83.6	113.1	106.7	101.5	100.5	92.9
80	98.5	84.0	84.0	80.1	78.4	104.4	100.6	92.9	92.3	86.8
90	87.0	73.6	75.6	70.0	69.2	92.7	88.6	83.6	83.9	80.6
U. L.	64.0	50.4	57.6	57.0	61.0	68.0	67.4	61.0	54.6	65.0
No. of Cases	329	254	240	161	78	295	283	294	240	200
Median	119.7±1.7 P. E.	103.4±1.3 P. E.	99.8±1.4 P. E.	95.8±1.4 P. E.	92.6±1.2 P. E.	130.4±1.7 P. E.	119.0±1.3 P. E.	114.1±1.4 P. E.	112.6±1.5 P. E.	105.9±1.7 P. E.
Q	15.6	16.6	17.3	15.2	8.4	22.6	18.5	18.9	18.7	19.1

TABLE 230—*Continued*

PAGE 3

PERCENTILES	X					M				
	PRACTICE PAGE 3		MEMORY PAGE 3			PRACTICE PAGE 3		MEMORY PAGE 3		
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	243.0	192.9	743.3	354.9	360.0	242.9	248.6	1425.0	833.0	932.2
10	153.3	131.9	218.5	191.4	145.8	156.0	150.9	261.3	283.6	240.7
20	135.4	117.6	161.0	138.1	103.0	139.9	134.4	209.3	189.0	168.0
30	125.2	107.2	127.0	110.2	96.6	129.7	122.9	156.1	141.5	131.6
40	116.5	98.2	110.2	100.6	92.9	119.7	115.2	128.0	124.2	117.1
50	109.5	92.1	97.9	89.8	88.8	112.7	108.7	111.3	107.9	103.9
60	101.9	86.1	89.5	81.3	82.9	105.8	102.3	99.6	94.9	89.9
70	94.4	80.0	81.2	73.4	76.8	98.6	95.5	91.9	86.4	83.2
80	86.1	72.2	71.7	65.6	73.3	89.4	88.4	84.2	80.1	76.1
90	75.6	64.4	62.0	55.6	60.0	80.3	81.3	73.6	69.4	67.8
U. L. . . .	58.0	48.0	46.0	50.0	34.0	59.8	59.2	52.0	51.8	54.1
No. of Cases .	330	254	238	163	77	291	283	286	241	199
Median . . .	109.5±1.4 P. E.	92.1±1.5 P. E.	97.9±2.7 P. E.	89.8±2.7 P. E.	88.8±1.8 P. E.	112.7±1.5 P. E.	108.7±1.4 P. E.	111.3±3.2 P. E.	107.9±3.1 P. E.	103.9±3.1 P. E.
Q	20.0	18.2	33.8	27.1	12.4	20.4	18.4	47.3	41	35.1

MEMORY PAGE 4

PERCENTILES	X		M	
	14 yrs.	15 yrs.	14 yrs.	15 yrs.
L. L.	638.0	400.0	6000.0	1987.5
10 . .	212.7	162.0	217.2	225.3
20 . .	157.1	131.7	161.4	153.0
30 . .	130.2	114.0	140.5	130.2
40 . .	115.1	99.4	125.4	115.1
50 . .	106.4	88.9	112.6	103.9
60 . .	97.7	79.1	101.0	95.6
70 . .	88.7	72.9	92.6	88.5
80 . .	79.7	66.6	84.5	81.9
90 . .	69.1	60.3	73.5	70.4
U. L.	56.8	44.2	52.3	50.6
No. of Cases	331	254	291	284
Median	106.4±2.0 P. E.	88.9±2.1 P. E.	112.6±2.3 P. E.	103.9±2.2 P. E.
Q . .	29.8	26.6	31.2	28.2

TABLE 231 — SUBSTITUTION — INDEX

Girls

SUM OF PRACTICE PAGES

PERCENTILES	X					M				
	PAGES 1, 2, 3		PAGES 1, 2			PAGES 1, 2, 3		PAGES 1, 2		
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	780	603	438	482	503	847	903	506	515	420
10	516	424	302	271	272	540	513	334	326	330
20	466	393	265	249	247	482	451	302	299	294
30	431	376	249	237	232	452	418	283	282	269
40	409	346	236	225	219	424	396	266	265	257
50	389	332	224	212	207	404	378	253	249	244
60	368	314	216	200	197	386	354	241	241	230
70	347	295	207	189	188	366	343	230	233	218
80	322	278	197	178	179	341	326	216	218	206
90	294	256	181	162	140	308	303	197	207	190
U. L.	210	189	146	126	143	239	234	149	144	151
No. of Cases . .	327	252	239	158	78	295	278	293	240	199
Median	389±3.9 P. E.	332±3.9 P. E.	224±2.2 P. E.	212±2.8 P. E.	207±4.0 P. E.	404±4.1 P. E.	378±3.7 P. E.	253±2.6 P. E.	249±2.5 P. E.	244±3.1 P. E.
Q	57	49	27.5	28.5	28	56.5	50	35	33.0	35.0

TABLE 232 — SUBSTITUTION — ACCURACY IN PERCENTS

Girls

PERCENTILES	X					M				
	MEMORY PAGE 4		MEMORY PAGE 3			MEMORY PAGE 4		MEMORY PAGE 3		
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	28.0	26.0	26.0	48.0	34.0	24.0	8.0	12.0	22.0	22.0
10	76.6	76.6	66.0	81.4	78.5	71.2	75.0	64.5	62.6	69.0
20	85.9	85.3	79.6	88.9	87.1	80.9	85.3	76.4	76.2	82.0
30	92.1	91.8	87.5	93.2	96.1	87.0	91.7	84.2	82.9	91.2
40	94.7	95.6	94.0	96.8	98.2	92.0	95.7	91.3	92.4	96.0
50	96.9	97.1	95.2	98.8	99.5	95.8	97.2	94.6	95.1	97.6
60	98.1	98.1	97.0	100.0	100.0	97.4	98.2	96.4	96.8	98.7
70	98.6	98.6	100.0	100.0	100.0	98.3	98.6	97.6	100.0	99.7
80	99.1	99.1	100.0	100.0	100.0	98.9	99.1	100.0	100.0	100.0
90	99.5	99.5	100.0	100.0	100.0	99.5	99.5	100.0	100.0	100.0
U. L.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Cases . .	331	254	240	159	78	295	285	285	242	200
Median	96.9± .3 P. E.	97.1± .2 P. E.	95.2± .7 P. E.	98.8± .5 P. E.	99.5± .6 P. E.	95.8± .5 P. E.	97.2± .4 P. E.	94.6± .4 P. E.	95.1± .8 P. E.	97.6± .6 P. E.
Q	4.7	3.2	8.2	4.5	4.2	7.3	5.2	9.3	10.2	6.7

TABLE 233 — SUBSTITUTION — INDEX: DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls

Percentiles	Practice Page 1					Practice Page 2				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	7.7	25.2	18.7	27.2	33.5	12.8	27.5	11.4	26.6	25.4
20	6.5	20.0	19.6	26.5	27.0	9.9	20.3	12.8	22.1	22.7
30	6.5	19.1	18.3	24.2	21.2	11.4	18.5	14.8	19.4	16.3
40	8.1	18.4	16.5	23.6	17.7	10.5	16.9	13.3	17.5	15.8
50	8.4	16.7	14.9	22.3	18.4	10.7	15.6	14.3	16.8	13.3
60	8.2	15.0	13.5	22.9	18.2	9.1	15.8	13.3	16.2	10.9
70	8.4	14.8	14.4	23.2	17.9	7.1	16.1	12.3	15.2	9.3
80	8.2	16.1	11.2	24.3	16.0	5.9	16.6	8.9	12.2	8.4
90	6.4	17.4	9.0	20.4	10.5	5.7	15.0	8.0	13.9	11.4

Percentiles	Practice Page 3		Memory Page 3			Memory Page 4	
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.
10	2.7	19.0	42.8	92.2	94.9	4.5	63.3
20	4.5	16.8	48.3	50.9	65.0	4.3	21.3
30	4.5	15.7	29.1	31.3	35.0	10.3	16.2
40	3.2	17.0	17.8	23.6	24.2	10.3	15.7
50	3.2	16.6	13.4	18.1	15.1	6.2	15.0
60	3.9	16.2	10.1	13.6	7.0	3.3	16.5
70	4.2	15.5	10.7	13.0	6.4	3.9	15.6
80	3.3	16.2	12.5	14.5	2.8	4.8	15.3
90	4.7	16.9	11.6	13.8	.7	4.4	10.1

TABLE 234 — SUBSTITUTION — INDEX: DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls

SUM OF PRACTICE PAGES

Percentiles	Pages 1, 2, 3		Pages 1, 2		
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	24	89	32	55	58
20	16	58	37	50	47
30	21	42	34	45	37
40	15	50	30	40	38
50	15	46	29	37	37
60	18	40	25	41	33
70	19	48	23	44	30
80	19	48	19	40	27
90	14	47	16	45	50

accuracy of the memory page at seventeen and eighteen than they did at fourteen and fifteen. As in the case of the boys, the superiority of the school girls in index is greater at eighteen than it was at fourteen. Between fourteen and fifteen, the school girls gained more rapidly than the working girls, and thus show a greater degree of superiority at fifteen than at fourteen. The difference between school and working girls is greatest at seventeen years. The smaller difference at sixteen must be due to a more rapid gain on the part of working girls between fifteen and sixteen. The new school girls introduced at sixteen years (X_2) proved to have a somewhat higher index than the original series (X_1) in spite of their lack of practice (see Chapter VI).

As in the case of the boys, the amount of the X-M difference is much greater in the lower than in the upper half of the scale. In other words, the superiority of poor school girls over poor working girls in substitution is much more striking than the superiority of good school girls over good working girls.

TABLE 235

SUBSTITUTION — ACCURACY: DIFFERENCES IN PERCENTS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls

Percentiles	Memory Page 4		Memory Page 3		
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	5.4	1.6	1.5	8.8	9.5
20	5.0	.0	3.2	12.7	5.1
30	5.1	.1	3.3	10.3	4.9
40	2.7	−.1	2.7	4.4	2.2
50	1.1	−.1	.6	3.7	1.9
60	.7	−.1	.6	3.2	1.3
70	.3	.0	2.4	.0	.3
80	.2	.0	.0	.0	.0
90	.0	.0	.0	.0	.0

MEMORY

The memory test, which consisted in repetition of seven-, eight-, and nine-place series of digits by the visual-auditory-motor method, is presented in ten-percentile norms for boys, school (X) and working (M) series, in Tables 236 and 237. The differences between school and working boys are presented in Tables 238 and 239. The tables of differences show that the seven-place series was too easy to bring out differences of ability successfully. The differences are small and irregular. The differences of the eight-place series are larger and more consistent, and those of the nine-place series still larger and entirely consistent. It is clear that school boys are superior to working boys in immediate memory. The only instances in which at some points the working boys appear superior are sixteen-year tests, in the seven- and eight-place series. Since part of the school boys (X_2) were taking the test for the first time at sixteen, it seemed possible that the disadvantage under which they labored, due to lack of practice,

TABLE 236

MEMORY — PER CENT CORRECT

Boys

7-Place Series

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	21.4	46.5	57.1	39.3	71.4	39.3	46.0	21.5	42.9	42.9
10	74.0	77.2	84.1	82.9	87.6	64.8	75.3	83.1	76.6	79.4
20	83.7	88.8	90.5	90.9	91.6	75.6	85.9	89.8	87.4	85.5
30	87.9	92.3	92.6	93.8	93.4	84.4	88.9	92.7	92.1	90.5
40	90.7	94.8	94.4	95.8	94.4	88.4	91.7	95.2	93.6	92.3
50	93.0	96.2	95.1	96.5	95.1	91.1	94.2	96.3	95.5	93.7
60	95.3	97.1	95.8	97.3	96.6	93.1	96.1	97.2	96.6	95.1
70	96.7	98.0	97.3	98.0	97.3	95.2	97.2	98.0	97.6	96.6
80	98.0	98.9	98.0	98.7	98.0	97.1	98.5	98.9	98.6	98.0
90	99.3	99.7	99.4	99.4	99.4	98.8	99.5	99.8	99.6	98.7
U. L.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Cases	426	294	286	178	65	419	377	344	304	300
Median	93.0±.4 P. E.	96.2±.3 P. E.	95.1±.5 P. E.	96.5±.5 P. E.	95.1±.6 P. E.	91.1±.5 P. E.	94.2±.3 P. E.	96.3±.2 P. E.	95.5±.3 P. E.	93.7±.3 P. E.
Q	5.8	4.0	6.3	5.8	4.1	8.1	4.8	3.6	4.2	4.7

TABLE 236—*Continued*

8-PLACE SERIES

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	25.0	21.9	46.9	50.1	46.9	22.0	9.4	34.4	25.0	43.8
10	51.4	59.5	73.2	71.8	73.6	49.5	57.2	61.5	60.4	65.7
20	64.7	71.2	80.4	84.1	85.4	59.3	66.6	71.8	72.8	75.1
30	70.8	75.4	85.7	90.1	86.4	66.8	71.1	79.2	82.1	82.3
40	74.8	83.1	91.0	92.8	93.6	70.9	74.5	85.1	86.2	84.7
50	81.9	88.1	92.3	95.2	94.5	74.8	80.8	89.9	90.7	91.7
60	86.5	92.0	93.8	96.4	95.8	82.1	86.4	93.3	93.4	93.6
70	92.0	94.8	95.1	97.3	96.4	87.7	91.3	96.0	95.9	95.8
80	95.6	96.9	97.0	98.3	97.6	92.7	94.2	97.6	97.4	97.0
90	98.1	98.8	98.9	99.2	98.9	96.5	98.0	98.1	99.0	98.9
U. L.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Cases	426	293	286	178	65	420	376	346	304	300
Median	81.9± .8 P.E.	88.1± .9 P.E.	92.3± .5 P.E.	95.2± .5 P.E.	94.5± .9 P.E.	74.8± .8 P.E.	80.8± .8 P.E.	89.9± .7 P.E.	90.7± .7 P.E.	91.7± .7 P.E.
Q	13.0	11.3	6.5	5.4	5.6	13.6	12.0	10.2	9.6	8.9

9-PLACE SERIES

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L.L.	19.5	30.6	33.3	44.5	52.8	11.0	17.0	25.0	16.7	27.8
10	47.8	53.4	59.5	62.2	63.2	44.4	46.3	50.4	51.7	51.2
20	58.1	60.9	67.1	72.5	71.2	51.4	53.6	60.2	62.0	60.3
30	62.9	66.1	71.7	78.6	78.2	56.6	59.0	65.7	68.4	69.3
40	66.9	70.3	77.6	85.2	82.4	60.6	64.3	69.9	73.9	76.2
50	70.9	75.0	82.4	88.5	86.2	66.1	69.5	74.4	79.7	80.3
60	74.5	82.0	86.4	91.8	88.4	71.4	73.7	81.1	85.6	85.9
70	81.8	86.1	91.0	95.8	92.6	75.8	81.6	86.1	88.9	88.9
80	87.7	91.0	93.4	97.2	97.2	83.6	87.2	90.5	92.7	93.7
90	93.4	96.3	95.6	98.7	98.0	92.1	93.6	94.9	96.8	96.7
U.L.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Cases	426	294	286	178	64	420	377	346	303	300
Median	70.9± .7 P.E.	75.0± .9 P.E.	82.4± .9 P.E.	88.5± .9 P.E.	86.2±1.5 P.E.	66.1± .8 P.E.	69.5± .9 P.E.	77.4± .9 P.E.	79.7± .9 P.E.	80.3± .9 P.E.
Q	12.2	12.6	11.4	10.2	10.1	12.9	14.1	12.7	12.8	13.3

might be lowering the record of school boys for that year. Accordingly the percentiles for X_1 and X_2 were worked out separately in the case of the seven- and nine-place series. The differences between the two were too small and too irregular to modify the outcome appreciably. In the seven-place series X_1 and X_2 differed by only a fraction of a point (median 0.3) in favor of X_2. In the nine-place series the median difference was 0.9 points in favor of X_1. The slight temporary superiority of working boys at some points in year sixteen probably has no significance beyond that of a temporary shift in values between two series which differ only slightly at best.

There are several interesting trends in the table of differences. On the whole, the superiority of the school boys increases up to seventeen years. This is particularly evident in the more significant tables of the nine-place series and the sum. At eighteen, the difference is greater than at fourteen. We can say, therefore, that the period of rapid gain in memory lasts up to seventeen years, and the amount of gain is somewhat greater for the school than for the working boys. The comparison of the upper and lower halves

TABLE 237 — MEMORY — SUM OF THE 7-, 8-, AND 9-PLACE SERIES

Boys

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	111	119	144	179	159	109	53	109	120	134
10	193	207	227	229	228	172	192	208	204	214
20	210	226	245	250	247	191	209	224	223	234
30	220	239	258	262	262	207	223	239	239	246
40	231	248	267	272	268	223	232	249	250	258
50	241	258	275	280	279	232	242	259	262	269
60	251	266	282	285	285	242	251	267	272	278
70	260	274	283	291	290	251	262	276	280	285
80	273	283	291	300	299	265	273	284	288	293
90	287	294	299	300	300	283	287	293	299	300
U. L.	300	300	300	300	300	300	300	300	300	300
No. of Cases . .	426	293	285	175	65	418	377	343	299	298
Median	241±1.5 P. E.	258±1.7 P. E.	275±1.2 P. E.	280±2.0 P. E.	279±3.1 P. E.	232±1.6 P. E.	242±1.6 P. E.	259±1.5 P. E.	262±1.8 P. E.	269±1.9 P. E.
Q	26	23	17.5	20	20.1	29.5	26	24	29.5	24.5

TABLE 238

MEMORY: DIFFERENCES IN PERCENTS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

7-Place Series

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	9.2	1.9	1.0	6.3	8.2
20	8.1	2.9	.7	3.5	6.1
30	3.5	3.4	− .1	1.7	2.9
40	2.3	3.1	− .8	2.2	2.1
50	1.9	2.0	−1.1	1.0	1.4
60	2.2	1.0	−1.4	.7	1.5
70	1.5	.8	− .7	.4	.7
80	.9	.4	− .9	.1	.0
90	.5	.2	− .4	−.2	.7

8-Place Series

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	1.9	2.3	1.7	11.4	7.9
20	5.4	4.6	8.6	11.3	10.3
30	4.0	4.3	6.5	8.0	4.1
40	3.9	8.6	5.9	6.6	8.9
50	7.1	7.3	3.4	4.5	2.8
60	4.4	5.6	.5	3.0	2.2
70	4.3	3.5	− .9	1.4	.6
80	2.9	2.7	− .6	.9	.6
90	1.6	.8	.8	.2	.0

9-Place Series

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	3.4	7.1	9.1	10.5	12.0
20	6.7	7.3	6.9	10.5	10.9
30	6.3	7.1	6.0	10.2	8.9
40	6.3	6.0	7.7	11.3	6.2
50	4.8	5.5	8.0	8.8	5.9
60	3.1	8.3	5.3	6.2	2.5
70	6.0	4.5	4.9	6.9	3.7
80	4.1	3.8	2.9	4.5	3.5
90	1.3	2.7	.7	1.9	1.3

TABLE 239

MEMORY — SUM OF 7-, 8-, AND 9-PLACE SERIES: DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	21	15	19	25	14
20	19	17	21	27	13
30	13	16	19	23	16
40	8	16	18	22	10
50	9	16	16	18	10
60	9	15	15	13	8
70	9	12	7	11	5
80	8	10	7	12	6
90	4	7	6	1	0

TABLE 240

MEMORY — PER CENT CORRECT

Girls

7-Place Series

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	42.9	46.5	64.3	64.3	67.9	35.0	57.0	39.3	57.2	57.2
10	73.4	78.5	88.0	88.1	85.5	67.9	77.6	82.9	75.1	78.0
20	80.4	88.1	91.2	92.6	91.9	76.7	86.9	90.0	84.2	89.7
30	88.1	92.1	93.1	96.0	93.7	85.7	89.9	93.0	90.8	91.9
40	91.3	94.8	94.4	96.3	94.4	89.0	93.1	95.7	93.8	93.2
50	93.6	96.2	95.1	97.0	95.1	91.8	95.8	96.5	96.0	94.4
60	95.7	97.1	96.6	97.6	96.5	93.9	96.8	97.3	96.9	95.2
70	97.0	97.9	97.3	98.3	97.3	95.9	97.8	98.1	97.8	96.6
80	98.2	98.9	98.0	98.8	98.0	97.5	98.6	99.5	98.8	97.9
90	99.4	99.8	99.4	99.5	99.4	99.2	99.7	99.8	99.7	98.7
U. L.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Cases . .	330	250	239	165	77	324	280	296	243	201
Median	93.6±.4 P.E.	96.2±.3 P.E.	95.1±.2 P.E.	97.0±.2 P.E.	95.1±.4 P.E.	91.8±.5 P.E.	95.8±.4 P.E.	96.5±.3 P.E.	96.0±.5 P.E.	94.4±.3 P.E.
Q	6.7	4.2	2.8	2.2	2.5	7.8	4.9	3.7	5.9	3.3

TABLE 240—*Continued*

8-PLACE SERIES

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	15.7	25.0	37.5	31.3	50.0	25.0	22.0	31.3	37.5	31.3
10	53.7	61.1	67.6	72.6	79.1	50.1	54.8	62.8	67.3	68.6
20	66.8	68.7	77.9	86.2	84.8	60.0	67.3	74.5	74.0	76.3
30	71.6	74.0	85.4	90.8	91.7	68.9	72.6	82.5	81.7	84.7
40	74.9	82.4	90.6	92.8	94.2	72.9	77.6	87.0	86.0	89.4
50	81.8	88.2	92.0	94.7	95.1	78.6	83.4	91.3	90.9	92.2
60	87.2	90.9	93.8	96.1	96.3	84.4	88.4	93.9	92.9	94.2
70	91.9	95.8	95.8	97.1	97.0	90.0	93.4	96.0	95.2	95.8
80	95.0	97.4	97.0	98.1	98.2	93.7	95.4	97.6	97.1	97.0
90	97.9	99.0	98.8	99.1	99.5	97.2	98.0	99.3	98.8	98.2
U. L.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Cases	330	250	239	165	78	325	280	296	243	201
Median	81.8± .7 P. E.	88.2± .9 P. E.	92.0± .5 P. E.	94.7± .4 P. E.	95.1± .6 P. E.	78.6± .8 P. E.	83.4± .8 P. E.	91.3± .7 P. E.	90.9± .7 P. E.	92.2± .7 P. E.
Q	10.2	11.0	6.6	4.1	4.1	11.1	10.2	8.3	8.2	7.3

9-PLACE SERIES

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	16.7	19.5	38.9	47.2	61.1	22.0	22.0	8.4	22.3	41.6
10	49.4	50.2	57.4	62.9	66.5	43.1	47.2	50.3	50.2	57.4
20	59.3	60.6	67.6	69.6	77.1	50.3	56.3	59.7	62.3	67.0
30	64.7	64.8	72.9	78.8	81.8	58.7	61.0	67.3	70.0	73.1
40	70.6	69.8	76.8	84.3	86.5	63.7	65.5	72.6	74.7	78.1
50	74.8	74.6	81.5	88.2	88.2	68.2	71.5	77.4	81.9	82.6
60	80.7	80.2	86.5	91.6	91.9	72.5	77.4	82.3	86.2	86.8
70	84.8	85.2	89.8	94.3	95.1	78.0	82.8	86.2	91.2	90.1
80	89.1	91.0	93.4	96.5	96.7	85.9	87.1	89.8	94.2	93.7
90	94.8	95.3	96.2	98.3	98.4	92.5	92.8	94.8	97.2	96.7
U. L.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of Cases	330	250	239	165	77	323	279	296	243	202
Median	74.8± .9 P. E.	74.6± .9 P. E.	81.5± .8 P. E.	88.2± .9 P. E.	88.2±1.2 P. E.	68.2± .9 P. E.	71.5± .9 P. E.	77.4± .9 P. E.	81.9± .6 P. E.	82.6± .9 P. E.
Q	12.5	12.7	10.2	10.6	8.2	13.8	13.2	12.3	9.4	10.9

of the table of differences shows the same trend as in cancellation and card-sorting. The differences are much greater in the lower than in the upper portions of the scale. Poor school boys have a greater superiority in memory over poor working boys than good school boys have over good working boys. The best of the school boys and the best of the working boys are very nearly on a par in memory, but the poorest of the school boys are very superior to the poorest of the working boys.

The ten-percentile scales for girls in the memory test, school girls (X) and working girls (M) separately, are given in Tables 240 and 241. The differences between school and working girls are presented in Tables 242 and 243. While the magnitude of the differences between school and working girls is somewhat less than that between school and working boys, the general trend of events is very similar. School girls are superior to working girls at every age. The only instances of an exception occur at sixteen, in the seven- and eight-place series.

To test the effect of the introduction of a new and unpracticed series of girls at sixteen years, the X_1 and X_2 percentile scales were worked out

TABLE 241

MEMORY — SUM OF 7-, 8-, AND 9-PLACE SERIES

Girls

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
L. L.	132	103	183	162	190	120	137	141	123	151
10	198	205	229	236	244	175	194	211	205	220
20	211	218	243	252	259	197	211	231	226	240
30	224	232	254	264	272	213	226	245	243	255
40	237	247	264	275	280	225	237	254	256	264
50	247	255	272	280	284	235	250	264	266	272
60	256	266	280	285	288	246	259	271	274	281
70	265	275	285	288	296	256	266	279	283	285
80	276	283	291	298	300	268	278	285	289	290
90	288	294	300	300	300	284	287	293	300	300
U. L.	300	300	300	300	300	300	300	300	300	300
No. of Cases . .	329	250	239	162	77	323	279	289	241	202
Median	247±1.8 P. E.	251±2.0 P. E.	272±1.6 P. E.	280±1.7 P. E.	284±2.2 P. E.	235±2.8 P. E.	250±2.1 P. E.	261±1.9 P. E.	266±2.0 P. E.	272±2.0 P. E.
Q	26.5	27	19.5	17.5	16.5	29	26.5	22	25.5	20

TABLE 242

MEMORY: DIFFERENCES IN PERCENTS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls

7-Place Series

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	5.5	.9	5.1	13.7	7.5
20	3.7	1.2	1.2	8.4	2.2
30	2.4	1.2	.1	5.2	1.8
40	2.0	1.7	−1.3	2.5	1.2
50	1.8	.4	−1.4	1.0	.7
60	1.8	.3	− .7	.7	1.3
70	1.1	.1	− .8	.5	.7
80	.7	.3	−1.5	.0	.1
90	.2	.1	− .4	−.2	.7

8-Place Series

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	3.6	6.3	4.8	5.3	10.5
20	6.8	1.4	3.4	12.2	8.5
30	2.7	1.4	2.9	9.1	7.0
40	2.0	4.8	3.6	6.8	4.8
50	3.2	4.8	.7	3.8	2.9
60	2.8	2.5	−.1	3.2	2.1
70	1.9	2.4	−.2	1.9	1.2
80	1.3	2.0	−.6	1.0	1.2
90	.7	1.0	−.5	.3	1.3

9-Place Series

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	6.3	3.0	7.1	2.7	9.1
20	9.0	4.3	7.9	7.3	10.1
30	6.0	3.8	5.6	8.8	8.7
40	6.9	4.3	4.2	9.6	8.4
50	6.6	3.1	4.1	6.3	5.6
60	8.2	2.8	4.2	4.8	5.1
70	6.8	2.4	3.6	3.1	5.0
80	3.2	3.9	3.6	2.3	3.0
90	2.3	2.5	1.4	1.1	1.7

separately for the seven- and the nine-place series. There was no difference between them which could have modified the outcome appreciably. The X_2 girls ranked 0.1 points above the X_1 girls in the median of the seven-place series, and 0.7 points below in the nine-place series (see Chapter VI). The temporary superiority of working girls in some parts of the sixteen year scales probably has no real significance.

The superiority of the school girls at eighteen is about the same as it was at fourteen. In the case of the girls, no clear differences in yearly rates of gain appear except that the working girls improved much faster between fourteen and fifteen than the school girls, while the school girls gained more between fifteen and seventeen than the working girls.

The same type of contrast between the lower and the upper portions of the table of differences appears as in the case of the boys. The differences are greater in the lower than in the upper half of the scale. That is to say, while the best of the school girls are little if any superior to the best of the working girls, the poorest of the school girls are decidedly superior to the poorest of the working girls.

TABLE 243

MEMORY — SUM OF 7-, 8-, AND 9-PLACE SERIES: DIFFERENCES BETWEEN TEN-PERCENTILE SCALES (X-M)

Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	23	11	18	31	24
20	14	9	12	26	19
30	11	6	9	21	17
40	12	10	10	9	16
50	12	5	8	14	12
60	10	7	9	11	7
70	9	9	6	5	11
80	8	5	6	9	10
90	4	7	7	0	0

Sentence Completion

Five different blanks were used in the sentence-completion test. While they were not accurately standardized, their differences in difficulty were slight. A different form was used each year, so that any child who was tested in three successive years used three of the five blanks. No systematic selection of blanks was made, except to be sure that a new blank was used at each repetition of the test. Table 244 shows the comparatively haphazard way in which the blanks were selected—the number of times each of the five was used at year sixteen. Group differences which are somewhat consistent from year to year could thus not be explained on the ground of the use of the blanks.

TABLE 244

SENTENCES

X

Age	Boys						Girls					
	Form a	Form b	Form c	Form d	Form e	Total	Form a	Form b	Form c	Form d	Form e	Total
16 yrs.	70	91	33	13	70	277	20	60	28	11	110	229
						M						
16 yrs.	25	101	76	70	72	344	19	134	71	48	21	293

TABLE 245

SENTENCES — INDEX OF IDEAS

Boys

Percentiles	X			M		
	14 yrs.	15 yrs.	16 yrs.	14 yrs.	15 yrs.	16 yrs.
L. L.	35.6	30.2	19.0	106.0	99.4	66.0
10	15.8	13.1	11.7	20.5	20.2	19.7
20	13.5	10.3	9.7	16.2	15.4	15.4
30	12.0	9.1	8.9	13.9	12.8	13.5
40	10.7	8.3	8.2	12.4	11.7	12.0
50	9.7	7.7	7.5	11.1	10.5	10.9
60	8.8	7.2	6.9	10.0	9.6	9.7
70	8.0	6.7	6.3	9.2	8.8	8.6
80	7.2	6.2	5.8	8.4	7.5	7.6
90	6.5	5.8	5.2	7.2	6.8	6.6
U. L.	3.9	3.5	3.5	4.7	4.9	3.3
No. of Cases	424	291	281	401	359	344
Median	9.7±1.6 P. E.	7.7± .1 P. E.	7.5± .1 P. E.	11.1± .2 P. E.	10.5± .2 P. E.	10.9± .2 P. E.
Q	2.6	1.6	1.6	3.2	3.0	3.2

The ten-percentile norms for the sentence-completion test are presented for school (X) and working (M) boys separately in Tables 245 to 248. The differences between the percentiles for school and those for working boys (X-M) are given in Tables 249 to 252. A glance at these tables shows that the school boys are superior to the working boys in every measure of

TABLE 246 — SENTENCES — NUMBER BEGUN IN TWO SECONDS OR LESS

Boys

Percentiles	X			M		
	14 yrs.	15 yrs.	16 yrs.	14 yrs.	15 yrs.	16 yrs
L. L. . . .	.0	.0	0.0	.0	.0	.0
10	.7	1.6	1.9	.8	.0	.0
20	1.9	3.7	3.4	1.7	1.5	1.2
30	3.2	5.7	5.0	2.6	2.9	2.4
40	4.5	7.1	6.4	4.2	4.4	3.5
50	5.8	8.3	8.3	4.9	5.7	4.6
60	7.0	9.3	10.1	5.9	6.9	5.7
70	8.4	10.2	11.3	6.9	8.1	6.8
80	9.7	11.1	12.3	8.3	9.3	8.5
90	11.2	12.1	13.2	10.0	10.7	10.3
U. L. . . .	13.0	13.0	14.0	13.0	13.0	13.0
No. of Cases	430	291	277	407	367	344
Median . .	5.8±.2 P. E.	8.3±.2 P. E.	8.3±.3 P. E.	4.9±.2 P. E.	5.7±.2 P. E.	4.6±.2 P. E.
Q	3.3	3.0	3.8	2.7	3.3	3.0

TABLE 247 — SENTENCES — NUMBER CORRECT

Boys

Percentiles	X			M		
	14 yrs.	15 yrs.	16 yrs.	14 yrs.	15 yrs.	16 yrs.
L. L. . . .	7.0	7.0	9.0	6.0	7.0	5.0
10	10.7	11.4	12.0	8.8	10.3	9.5
20	11.9	12.3	12.5	9.8	11.4	10.8
30	12.4	12.8	13.0	10.6	12.1	11.8
40	12.9	13.1	13.2	11.3	12.6	12.3
50	13.1	13.2	13.3	11.9	13.0	12.7
60	13.3	13.4	13.4	12.4	13.2	13.1
70	13.5	13.5	13.6	12.8	13.4	13.3
80	13.6	13.7	13.7	13.2	13.6	13.5
90	13.8	13.8	13.9	13.6	13.8	13.8
U. L. . . .	14.0	14.0	14.0	14.0	14.0	14.0
No. of Cases	430	292	282	417	365	345
Median . .	13.1±.04 P. E.	13.2±.04 P. E.	13.3±.03 P. E.	11.9±.09 P. E.	13.0±.05 P. E.	12.7±.07 P. E.
Q	.7	.5	.5	1.4	.9	1.1

TABLE 248

SENTENCES — NUMBER OF IDEAS

Boys

Percentiles	X			M		
	14 yrs.	15 yrs.	16 yrs.	14 yrs.	15 yrs.	16 yrs.
L. L. . . .	9.0	9.0	9.0	6.0	7.0	10.0
10	14.8	14.3	16.9	12.4	13.8	13.4
20	17.7	17.3	19.3	12.8	16.4	15.4
30	19.9	19.3	21.5	14.2	18.5	17.2
40	22.2	20.8	23.6	15.4	20.4	19.5
50	23.8	22.2	25.5	16.8	22.1	21.6
60	25.9	24.3	27.6	18.4	23.7	23.6
70	28.2	26.6	30.1	20.5	25.9	25.5
80	30.7	29.6	32.5	22.6	28.4	27.5
90	34.9	33.5	38.1	25.5	32.3	31.1
U. L. . . .	59.0	69.0	82.0	59.0	59.0	58.0
No. of Cases	430	291	282	418	365	345
Median . .	23.8±.3 P.E.	22.2±.4 P. E.	25.5±.4 P. E.	16.8±.3 P. E.	22.1±.3 P. E.	21.6±.4 P. E.
Q	5.4	4.9	5.5	4.1	4.9	5.1

TABLE 249

SENTENCES — INDEX OF IDEAS: DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

Percentiles	14 yrs.	15 yrs.	16 yrs.
10	4.7	7.1	8.0
20	2.7	5.1	5.7
30	1.9	3.7	4.6
40	1.7	3.4	3.8
50	1.4	2.8	3.4
60	1.2	2.4	2.8
70	1.2	2.1	2.3
80	1.2	1.3	1.8
90	.7	1.0	1.4

TABLE 250

SENTENCES — NUMBER BEGUN IN TWO SECONDS OR LESS: DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

Percentiles	14 yrs.	15 yrs.	16 yrs.
10	−.1	1.6	1.9
20	.2	2.2	2.2
30	.6	2.8	2.6
40	.3	2.7	2.9
50	.9	2.6	3.7
60	1.1	2.4	4.4
70	1.5	2.1	4.5
80	1.4	1.8	3.8
90	1.2	1.4	2.9

TABLE 251

SENTENCES — NUMBER CORRECT: DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

Percentiles	14 yrs.	15 yrs.	16 yrs.
10	1.9	1.1	2.5
20	2.1	.9	1.7
30	1.8	.7	1.2
40	1.6	.5	.9
50	1.2	.2	.6
60	.9	.2	.3
70	.7	.1	.3
80	.4	.1	.2
90	.2	0	.1

TABLE 252

SENTENCES — NUMBER OF IDEAS: DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

Percentiles	14 yrs.	15 yrs.	16 yrs.
10	2.4	.5	3.5
20	4.9	.9	3.9
30	5.7	.8	4.3
40	6.8	.4	4.1
50	7.0	.1	3.9
60	7.5	.6	4.0
70	7.7	.7	4.6
80	8.1	1.2	5.0
90	9.4	1.2	7.0

TABLE 253 — SENTENCES — INDEX OF IDEAS

Girls

PERCENTILES	X			M		
	14 yrs.	15 yrs.	16 yrs.	14 yrs.	15 yrs.	16 yrs.
L. L.	44.2	30.4	39.1	42.0	90.0	49.1
10	17.6	13.5	10.7	18.0	19.4	18.4
20	14.3	10.6	9.2	14.9	15.9	15.1
30	12.1	9.4	8.0	13.2	12.4	12.4
40	10.9	8.3	7.5	11.9	10.9	11.0
50	9.8	7.7	6.8	10.7	10.2	9.9
60	8.8	7.0	6.4	9.7	9.4	9.0
70	7.9	6.4	5.9	8.8	8.5	8.1
80	7.1	6.1	5.4	7.9	7.6	7.2
90	6.3	5.7	4.9	7.0	6.7	7.0
U. L.	3.4	3.6	3.4	4.9	4.2	2.9
No. of Cases	320	252	227	319	257	286
Median	9.8±.2 P. E.	7.7±.2 P. E.	6.8±.1 P. E.	10.7±.2 P. E.	10.2±.2 P. E.	9.9±.2 P. E.
Q	2.9	1.9	1.5	2.9	3.1	3.1

TABLE 254 — SENTENCES — NUMBER BEGUN IN TWO SECONDS OR LESS

Girls

PERCENTILES	X			M		
	14 yrs.	15 yrs.	16 yrs.	14 yrs.	15 yrs.	16 yrs.
L. L.	0.0	0.0	0.0	0.0	0.0	0.0
10	.3	.7	1.8	.6	0	.7
20	1.9	2.3	3.4	1.6	.9	2.3
30	3.5	4.0	5.1	2.8	1.9	4.0
40	4.9	5.5	6.3	3.7	3.0	5.5
50	6.4	6.7	7.2	4.7	4.9	6.7
60	7.2	8.1	9.1	5.8	6.1	8.1
70	8.5	9.6	10.2	7.1	7.3	9.6
80	9.9	11.0	11.2	8.3	8.6	11.0
90	11.3	12.0	12.8	9.6	10.5	12.0
U. L.	13.0	13.0	13.0	13.0	13.0	13.0
No. of Cases	332	254	229	324	259	293
Median	6.4±.2 P. E.	6.7±.2 P. E.	7.2±.2 P. E.	4.7±.2 P. E.	4.9±.2 P. E.	6.7±.3 P. E.
Q	3.3	3.6	3.2	2.8	3.3	3.6

TABLE 255 — SENTENCES — NUMBER CORRECT

Girls

Percentiles	X			M		
	14 yrs.	15 yrs.	16 yrs.	14 yrs.	15 yrs.	16 yrs.
L. L. . . .	4.0	9.0	9.0	6.0	9.0	6.0
10	11.0	11.5	12.2	8.9	9.4	10.4
20	11.9	12.4	12.9	10.0	11.1	11.6
30	12.3	13.0	13.1	10.7	12.1	12.3
40	12.7	13.1	13.2	11.4	12.4	12.7
50	13.1	13.3	13.4	12.1	12.8	13.0
60	13.2	13.4	13.5	12.4	13.1	13.2
70	13.4	13.6	13.6	12.8	13.3	13.3
80	13.6	13.7	13.7	13.1	13.6	13.6
90	13.8	13.9	13.9	13.6	13.9	13.8
U. L. . . .	14.0	14.0	14.0	14.0	14.0	14.0
No. of Cases	331	254	231	325	263	293
Median . .	13.1± .05 P. E.	13.3± .04 P. E.	13.4± .03 P. E.	12.1± .09 P. E.	12.8± .10 P. E.	13.0± .06 P. E.
Q	.7	.5	.4	1.3	1.5	.8

TABLE 256 — SENTENCES — NUMBER OF IDEAS

Girls

Percentiles	X			M		
	14 yrs.	15 yrs.	16 yrs.	14 yrs.	15 yrs.	16 yrs.
L. L. . . .	7.0	11.0	12.0	7.0	5.0	10.0
10	16.0	15.2	19.3	12.4	13.9	14.4
20	18.8	17.6	21.9	13.2	16.7	16.9
30	20.0	19.2	23.6	14.8	18.6	18.9
40	22.9	20.9	25.6	16.0	20.6	20.8
50	25.1	22.5	27.9	17.5	22.7	22.8
60	26.9	24.1	29.8	18.8	24.6	24.5
70	28.8	26.7	31.9	20.4	26.4	26.6
80	31.4	29.8	34.9	23.3	28.4	28.8
90	36.2	36.5	39.8	26.2	31.6	32.8
U. L. . . .	55.0	59.0	71.0	39.0	44.0	46.0
No. of Cases	332	243	232	325	262	293
Median . .	25.1± .4 P. E.	22.5± .4 P. E.	27.9± .4 P. E.	17.5± .3 P. E.	22.7± .4 P. E.	22.8± .4 P. E.
Q	5.4	5.0	5.3	4.0	5.1	4.9

TABLE 257

SENTENCES—INDEX OF IDEAS: DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.
10	.4	5.9	7.7
20	.6	5.3	5.9
30	1.1	3.0	4.4
40	1.0	2.6	3.5
50	.9	2.5	3.1
60	.9	2.4	2.6
70	.9	2.1	2.2
80	.8	1.5	1.8
90	.7	1.0	2.1

TABLE 258

SENTENCES — NUMBER BEGUN IN TWO SECONDS OR LESS: DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.
10	−.3	.7	1.1
20	+.3	1.4	1.1
30	.7	2.1	1.1
40	1.2	2.5	.8
50	1.7	1.8	.5
60	1.4	2.0	1.0
70	1.4	2.3	.6
80	1.3	2.4	.2
90	1.7	1.5	.8

TABLE 259

SENTENCES — NUMBER CORRECT: DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.
10	2.1	2.1	1.8
20	1.9	1.3	1.3
30	1.6	.9	.8
40	1.3	.7	.5
50	1.0	.5	.4
60	.8	.3	.3
70	.6	.3	.3
80	.5	.1	.1
90	.2	.0	.1

TABLE 260

SENTENCES — NUMBER OF IDEAS: DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls

PERCENTILES	14 yrs.	15 yrs.	16 yrs.
10	3.6	1.3	4.9
20	5.6	.9	5.0
30	5.2	.6	4.7
40	6.9	.3	4.8
50	7.6	−.2	5.1
60	8.1	−.5	5.3
70	8.4	.3	5.3
80	8.1	1.4	6.1
90	10.0	4.9	7.0

the test, and at every age. The measure of the number of ideas and that of number of correct sentences proved to be unsatisfactory for reasons stated in Chapter IV. In index of ideas (average number of seconds per idea expressed) and in association time (number of sentences begun in two seconds or less), the school group is more superior at fifteen than at fourteen, and still more superior at sixteen than at fifteen. This means that school boys gain more rapidly than working boys in ability to perform this test in the years between fourteen and sixteen. They make a larger gain between fourteen and fifteen than between fifteen and sixteen.

In the index of ideas, the tendency found in most of the mental tests to display a greater contrast between working and school boys in the lower than in the upper ranges of the scale is once more evident. There is more difference between poor school boys and poor working boys in this measure than between the good ones. In association time this tendency does not appear. There is a slight tendency for the reverse to be true.

The ten-percentile norms in the sentence-completion test are presented for school (X) and working (M) girls separately in Tables 253 to 256. The differences between the two sets of percentiles are given in Tables 257 to 260. As in the case of the boys, the tables show at once a superiority of the school girls over the working girls in every measure. In the index of ideas the course of events is the same as for the boys. The school girls gain more rapidly than the working girls from fourteen to fifteen and again from fifteen to sixteen. In association time, the school girls gain most rapidly between fourteen and fifteen and the working girls between fifteen and sixteen. In the index, among girls also the differences between the two groups are greater in the lower than in the upper ranges of the scale. In other words, the difference in index of ideas between poor school girls and poor working girls is greater than the difference between good school girls and good working girls.

Mutilated Text

The ten-percentile norms for the mutilated-text test, which was given instead of the sentence test at seventeen and eighteen, are given for school (X) and working (M) boys separately in Tables 261 and 262. The differences between the percentiles for school boys and those for working boys are given in Tables 263 and 264. Both in time and in accuracy the school boys are very superior to the working boys. The differences are somewhat larger at seventeen than at eighteen. In this test also the tendency for the differences to be larger in the lower than in the upper half of the table of differences is striking both in time and in accuracy. This means that the difference in ability to perform the test between poor school boys and poor working boys is much greater than between good school boys and good working boys. With a repetition of the test a second year, the group with the poorest record gained most.

TABLE 261

MUTILATED TEXT — TIME IN SECONDS

Boys

Percentiles	X		M	
	17 yrs.	18 yrs.	17 yrs.	18 yrs.
L. L.	480.0+	480.0+	480.0+	480.0+
10	470.2	349.8	501.4	481.2
20	367.3	279.0	489.0	382.8
30	305.5	221.5	458.3	331.5
40	274.3	179.0	413.8	297.8
50	249.5	161.0	372.6	262.1
60	219.0	142.9	330.9	232.4
70	194.0	124.3	290.4	198.7
80	164.0	104.0	237.6	172.8
90	127.3	89.2	194.6	132.1
U. L.	65.0	43.0	112.0	55.0
No. of Cases	174	65	309	255
Median	249.5± 7.4 P. E.	161 ±10.6 P. E.	372.6± 7.5 P. E.	262.1± 6.7 P. E.
Q	78.7	68.1	104.9	85.7

TABLE 262

MUTILATED TEXT — ACCURACY IN PERCENTS

Boys

Percentiles	X		M	
	17 yrs.	18 yrs.	17 yrs.	18 yrs.
L. L.	18.8	15.6	.0	3.0
10	51.5	57.7	20.1	22.6
20	63.2	63.2	29.8	38.3
30	70.1	70.3	35.6	44.0
40	74.6	73.0	44.1	48.4
50	81.4	75.5	49.5	56.0
60	85.2	82.3	56.8	60.5
70	91.1	85.7	65.1	67.9
80	93.7	92.0	72.5	74.1
90	97.7	96.7	83.8	89.3
U. L.	100.0	100.0	100.0	100.0
No. of Cases	176	66	310	257
Median	18.4±1.2 P.E.	75.5±1.7 P.E.	49.5± .8 P.E.	56 ±1.2 P.E.
Q	12.9	11.0	12.1	14.9

TABLE 263

MUTILATED TEXT — TIME: DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

Percentiles	17 yrs.	18 yrs.
10	31.2	31.4
20	121.7	103.8
30	152.8	110.0
40	139.5	118.8
50	123 1	101.1
60	111.9	89.5
70	96.4	74.4
80	73.6	68.8
90	67.3	42.9

The two forms used in this test were not accurately standardized to prove their equal difficulty. A brief series of trials on adults not included in this series indicated that they were approximately equal for most people. Since the test was given in two successive years, each subject who took both seventeen- and eighteen-year tests had both forms. Form A was used in the majority of cases at year seventeen, and Form B at year eighteen. Table 265 shows the frequency with which the two forms were used at the two years. Since the proportion is approximately the same for working and for school boys, the form used has no bearing on the differences found between the two groups.

In the case of the girls the course of events in the mutilated-text test is very similar to that of the boys. The ten-percentile scales for school (X)

TABLE 264

MUTILATED TEXT — ACCURACY: DIFFERENCES IN PERCENTS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

Percentiles	17 yrs.	18 yrs.
10	31.4	35.1
20	33.4	24.9
30	34.5	26.3
40	30.5	24.6
50	31.9	19.5
60	28.4	21.8
70	26.0	17.8
80	21.2	17.9
90	13.9	7.4

TABLE 265

MUTILATED TEXT — NUMBER OF TIMES EACH FORM WAS USED

Boys

X

Age	Form A	Form B	Total
17 years	162	12	174
18 years	26	39	65

M

Age	Form A	Form B	Total
17 years	228	81	309
18 years	51	204	255

and working (M) girls separately are given in Tables 266 and 267. The differences between the percentiles for school girls and those for working girls (X-M) are given in Tables 268 and 269. The school girls prove to be very superior to the working girls both in time and in accuracy at seventeen and at eighteen. As in the case of the boys, the differences are somewhat greater at seventeen than at eighteen. There is among the girls also a marked tendency for the X-M differences in the lower half of the scale to be larger than those in the upper half. In other words, the poor school girls are much more superior to the poor working girls than the good school girls are to the good working girls.

The number of times Form A and Form B were used for the girls is shown in Table 270. Since the proportional frequency of the two forms is nearly the same for working and school girls, differences between them cannot be explained on the ground of a possible difference in difficulty between the two blanks.

TABLE 266

MUTILATED TEXT — TIME IN SECONDS

Girls

Percentiles	X		M	
	17 yrs.	18 yrs.	17 yrs.	18 yrs.
L. L.	480.0	479.0	685.0	840.0
10	421.8	285.7	503.2	417.8
20	359.8	256.2	491.2	365.5
30	312.5	214.0	476.5	323.5
40	280.5	184.0	423.3	286.5
50	254.8	157.6	368.5	244.8
60	204.5	127.1	325.0	217.3
70	171.7	115.9	289.6	190.0
80	144.6	104.6	248.7	162.5
90	114.7	85.1	194.0	138.0
U. L.	77.0	65.0	127.0	55.0
No. of Cases . . .	163	72	246	137
Median	254.8±8.7 P. E.	157.6±9.2 P. E.	368.5±8.6 P. E.	244.8±9.0 P. E.
Q	89.0	62.4	107.4	84.1

TABLE 267

MUTILATED TEXT — ACCURACY IN PERCENTS

Girls

Percentiles	X		M	
	17 yrs.	18 yrs.	17 yrs.	18 yrs.
L. L.	21.9	30.6	.0	3.1
10	62.1	67.1	23.2	26.1
20	72.1	73.2	34.2	37.5
30	77.3	80.2	43.9	44.8
40	82.9	84.7	50.1	52.9
50	86.5	90.9	57.8	59.1
60	90.2	93.1	66.4	65.3
70	92.3	95.3	71.0	69.5
80	94.3	97.1	75.9	74.4
90	98.4	98.5	84.3	83.9
U. L.	100.0	100.0	100.0	100.0
No. of Cases	163	79	247	146
Median	86.5± .9 P. E.	90.9±1.4 P. E.	57.8±1.4 P. E.	59.1±1.7 P. E.
Q	9.3	9.8	17.2	15.4

TABLE 268

MUTILATED TEXT — TIME: DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls

Percentiles	17 yrs.	18 yrs.
10	81.4	132.1
20	131.4	109.3
30	164.0	109.5
40	142.8	102.5
50	113.7	87.2
60	120.5	90.2
70	117.9	74.1
80	104.1	57.9
90	79.3	52.9

TABLE 269

MUTILATED TEXT — ACCURACY: DIFFERENCES IN PERCENTS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls

PERCENTILES	17 yrs.	18 yrs.
10	38.9	41.1
20	37.9	35.7
30	35.4	35.4
40	32.8	31.8
50	28.7	31.8
60	23.8	27.8
70	21.3	25.8
80	18.4	22.7
90	14.1	14.6

TABLE 270

MUTILATED TEXT — NUMBER OF TIMES EACH FORM WAS USED

Girls

X

AGE	Form A	Form B	Total
17 years	144	19	163
18 years	24	48	72
M			
17 years	205	41	246
18 years	18	119	137

OPPOSITES

The frequency with which the various lists were used each year and for each group is shown in Table 271. The table shows a tendency, of which the experimenters themselves were somewhat conscious, to use the harder lists more frequently with school children and the easier ones with working children. The child who received a list very much too hard for him suffered from a sense of failure. When corrections were made on the basis of difficulty, the result was probably an advantage given to the school children.

The ten-percentile norms for boys in association by opposites, school (X) and working (M) boys separately, are presented in Table 272. The differences between the percentiles of the school and those of the working boys (X-M) are presented in Table 273. In the case of the opposites test, no satisfactory comparison of the course of events from year to year can be made because the content of the test differed so much in the several years (see Chapter IV).

The comparison of school and working boys at each age level is valid for the most part because conditions, with two exceptions, were kept fairly constant for each age. In the case of the opposites test, the blank used had a more important bearing on results than in any other test (see Chapter IV). The easy lists varied widely in difficulty. While the differences in difficulty were measured and allowance could be made when the hard lists were given, it still remained impossible to make allowances when a list which was too easy was given. A child who made a record of 100 per cent

TABLE 271

NUMBER OF TIMES DIFFERENT FORMS WERE USED FOR OPPOSITES

Boys

EASY OPPOSITES

X

AGE	Form 1	Form 2	Form 3	Form 4	Form 5	Form 6	Form 7	Form 8	Total
14	144	109	23	60	42	47	1	1	427
15	11	2	62	10	60	33	66	49	293
18		41				2			43
	155	152	85	70	102	82	67	50	763

M

AGE	Form 1	Form 2	Form 3	Form 4	Form 5	Form 6	Form 7	Form 8	Total
14	232	10			6				248
15		8	133	15	74	17		87	334
18	149	129				6			284
	381	147	133	15	80	23		87	866

HARD OPPOSITES

X

AGE	Form I	Form II	Form III	Total
17	9	120	45	174
18		22	42	64
	9	142	87	238

M

AGE	Form I	Form II	Form III	Total
17	76	94	139	309
18	23	28	21	72
	99	122	160	381

TABLE 272

EASY AND HARD OPPOSITES — ACCURACY IN PERCENTS (CORRECTED)

Boys

Percentiles	X			M		
	14 yrs. Easy	15 yrs. Easy	18 yrs. Easy	14 yrs. Easy	15 yrs. Easy	18 yrs. Easy
L. L.	12.1	18.9	80.0	0.	31.8	5.0
10	82.4	91.1	92.8	55.4	78.8	80.7
20	88.3	99.1	95.4	67.0	89.3	86.0
30	92.4	105.1	96.5	76.0	94.1	90.3
40	95.7	111.0	97.6	81.3	98.2	92.9
50	98.0	116.1	99.8	86.0	103.0	95.1
60	99.1	121.9	100.0	90.4	108.6	97.0
70	103.9	127.9	100.0	92.3	115.5	98.7
80	107.3	136.3	100.0	96.4	124.6	100.0
90	112.6	147.9	100.0	100.3	139.7	100.0
U. L.	138.9	172.7	100.0	108.6	181.8	100.0
No. of Cases . . .	427	293	43	248	334	284
Median	97.9± .4 P. E.	116.1±1.1 P. E.	99.8± .4 P. E.	86 ± .9 P. E.	103 ± .9 P. E.	95.1± .4 P. E.
Q	6.35	15.0	2.0	11.5	14.0	5.6

Percentiles	X		M	
	17 yrs. Hard	18 yrs. Hard	17 yrs. Hard	18 yrs. Hard
L. L.	27.5	35.0	0	0.
10	42.9	54.3	13	14.0
20	52.4	62.3	22	26.7
30	59.4	69.0	29	38.0
40	65.2	75.3	34	45.5
50	69.7	79.2	40	55.6
60	74.3	83.7	45	60.5
70	79.6	87.4	51	74.2
80	85.4	91.5	60	79.5
90	90.9	93.3	68	86.0
U. L.	100.0	100.0	97.5	90.0
No. of Cases . . .	174	64	309	72
Median	69.7±1.2 P. E.	79.2±1.9 P. E.	40±1.6	55.6±3.3 P.E.
Q	13.3	1.9	15.0	22.3

TABLE 273 — EASY AND HARD OPPOSITES: DIFFERENCES IN PERCENTS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

PERCENTILES	14 yrs. Easy	15 yrs. Easy	18 yrs. Easy	17 yrs. Hard	18 yrs. Hard
10	26.8	12.3	12.1	29.9	40.3
20	21.3	9.8	9.4	30.4	35.6
30	16.3	11.1	6.2	30.4	31.0
40	15.2	12.8	4.7	31.2	29.8
50	11.9	13.1	4.7	29.7	23.6
60	9.9	13.3	3.0	29.3	23.2
70	9.8	12.4	1.3	18.6	13.2
80	7.5	11.7	0	25.4	12.0
90	10.7	8.2	0	22.9	7.3

TABLE 274

NUMBER OF TIMES DIFFERENT FORMS WERE USED FOR OPPOSITES

Girls

EASY OPPOSITES

X

	Form 1	Form 2	Form 3	Form 4	Form 5	Form 6	Form 7	Form 8	Total
14 years	56	86	7	68	65	43		2	327
15 years	19	8	46	11	24	6	58	83	255
18 years		42							42
	75	136	53	79	89	49	58	85	624

M

	Form 1	Form 2	Form 3	Form 4	Form 5	Form 6	Form 7	Form 8	Total
14 years	216	11			6				233
15 years		1	124	6	81	5		39	256
18 years	17	172				6			195
	233	184	124	6	87	11		39	684

HARD OPPOSITES

X

	Form I	Form II	Form III	Total
17 years	1	105	57	163
18 years		23	56	79
	1	128	113	242

M

	Form I	Form II	Form III	Total
17 years	56	122	66	244
18 years	38	12	24	74
	94	134	90	318

on the easiest list might well have made a much higher record had a harder list been used.

The comparison of the two fourteen-year groups is modified by this factor. For the working children, who were examined first, the two easiest lists were used almost exclusively, while for the school children a large number of the harder lists were used. Those of the working children who made high records on the easy lists (from 10 to 20 per cent of them) might have made still higher records had harder lists been given them, and thus have reduced the difference between the two series. The difference is so large, however, that the superiority of the school children is undoubted, though its amount is indeterminate.

The comparison at fifteen is better than that at fourteen, because the distribution of the lists is better. In this case also, however, school children had a somewhat greater proportion of the very hard lists.

The hard opposites offer a better basis of comparison. Lists One and Two were approximately equal in value, while List Three was somewhat easier (about 10 per cent). The differences were so small that no corrections were made in this instance. Because of a misprint on one of the editions of List One, it happened that it was not used for school children. For this reason, List Three was used in a somewhat larger proportion of cases for school than for working children. Year seventeen offers an excellent basis of comparison, because the test was given to the entire group. At year eighteen only 72 working boys and 74 working girls were given the test. Those who had made bad failures, as shown by the easy-opposites test, and the previous seventeen-year hard-opposites test, were not given the hard list at year eighteen, because of its depressing effect. The seventy-odd cases selected in each sex, therefore, represent those with the best presumption of success. The difference between school and working groups remains astonishingly large, particularly in the lower ranges of the scale.

A glance at the table of differences shows that school boys were decidedly superior to working boys in association by opposites, at every age level, and in every form of the test used. It is also interesting to note that the differences were of much greater magnitude when lists of hard opposites were used than when lists of easy ones were used. The easy opposites were so far within the capacity of both working and school children that a large percentage of them had records which approximated perfection. Indeed, at eighteen years all of the school boys and 70 per cent of the working boys had records above 90 per cent accuracy.

Table 274 shows the number of times each list was used in testing the girls.

The ten-percentile norms for girls in association by opposites are presented for school (X) and working (M) girls separately in Table 275. The differences between the percentiles of school girls and those of working

TABLE 275

EASY AND HARD OPPOSITES — ACCURACY IN PERCENTS (CORRECTED)

Girls

PERCENTILES	X			M		
	14 yrs. Easy	15 yrs. Easy	18 yrs. Easy	14 yrs. Easy	15 yrs. Easy	18 yrs. Easy
L. L.	27.2	27.2	87.5	21.7	24.2	16.3
10	83.0	92.8	95.4	62.9	80.1	82.5
20	89.8	101.8	96.9	75.1	91.5	87.5
30	93.6	106.9	98.6	79.9	96.6	90.0
40	96.7	112.4	100.0	83.8	101.7	92.5
50	99.0	119.2	100.0	87.6	105.6	95.0
60	102.1	127.5	100.0	91.5	110.4	97.5
70	107.1	137.3	100.0	95.2	115.6	97.5
80	113.4	146.6	100.0	98.3	120.4	100.0
90	123.2	162.6	100.0	101.6	135.5	100.0
U. L.	172.7	181.8	100.0	114.0	177.2	100.0
No. of Cases	327	255	42	233	256	195
Median	99.0± .6 P. E.	119.2±1.3 P. E.	100.0±.2 P. E.	87.6±1.1 P. E.	105.6± .9 P. E.	95 ± .5 P. E.
Q	9.3	16.3	1.1	13.9	12.0	5.0

PERCENTILES	X		M	
	17 yrs. Hard	18 yrs. Hard	17 yrs. Hard	18 yrs. Hard
L. L.	27.5	32.5	0	5.0
10	53.2	62.4	14	27.7
20	63.0	69.2	20	35.5
30	67.8	75.6	26	41.8
40	71.9	81.3	32	50.7
50	77.0	84.8	39	56.2
60	81.1	89.5	45	63.0
70	84.8	91.8	51	70.7
80	87.9	95.1	56	79.0
90	91.6	98.8	68	85.7
U. L.	100.0	100.0	87.5	95.0
No. of Cases	163	79	244	74
Median	77±1.0 P. E.	84.8±1.5 P. E.	39±1.2 P. E.	56.2±1.6 P. E.
Q	10.5	10.6	15.2	18.0

TABLE 276

EASY AND HARD OPPOSITES: DIFFERENCES IN PERCENTS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls

Percentiles	14 yrs. Easy	15 yrs. Easy	18 yrs. Easy	17 yrs. Hard	18 yrs. Hard
10	20.1	11.7	12.9	39.2	34.7
20	14.7	20.3	9.4	43.0	33.7
30	13.7	10.3	8.6	41.8	33.8
40	12.9	10.7	7.5	39.9	30.6
50	11.4	13.6	5.0	38.0	28.6
60	10.6	17.1	2.5	36.1	26.5
70	11.9	21.7	2.5	33.8	21.1
80	15.1	26.2	0	31.9	16.1
90	21.6	27.1	0	23.6	13.1

girls (X-M) are presented in Table 276. The situation is much the same as in the case of the boys. School girls are superior to working girls in association by opposites at every age level and in every form of the test used. The degree of difference is much more striking when hard lists were used than when easy lists were used, for the obvious reason that the test in the easy form was too easy for both groups.

CAUSE AND EFFECT

Cause and effect was the form of association test used at sixteen years. The ten-percentile norms for school (X) and working (M) boys separately are given in Table 277. The differences between percentiles of school and working boys are given in Table 278. There is a very marked superiority of the school boys over the working boys. At the upper end of the scale both groups approach perfection, showing that the test was too easy for the best of both school and working boys. The differences at the lower part of the scale are exceedingly large—about a third of the range of the scale.

TABLE 277

CAUSE AND EFFECT — PER CENT CORRECT

Boys — 16 years

PERCENTILES	X	M
L. L.	0	0
10	75.1	39.7
20	83.5	52.7
30	87.5	62.6
40	93.6	70.7
50	95.6	76.9
60	97.1	81.4
70	100.0	86.7
80	100.0	91.5
90	100.0	96.0
U. L.	100.0	100.0
No. of Cases	289	317
Median	95.6±.5 P. E.	76.9±1.1 P. E.
Q	7.3	15.7

TABLE 278

CAUSE AND EFFECT—PER CENT CORRECT: DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys — 16 years

PERCENTILES	
10	35.4
20	30.8
30	24.9
40	22.9
50	18.7
60	15.7
70	13.3
80	8.5
90	4

The ten-percentile norms for school girls (X) and working girls (M) in cause and effect are given in Table 279, and the differences between the two sets of percentiles in Table 280. In this test also the school girls are superior. As in most other instances, the size of the difference is not so great as in the case of the boys. Both school and working girls reach perfection in the upper ranges of the scale, showing that it is too easy for the best of them. For this reason the differences disappear in the upper ranges. The differences between the poorest 10 per cent of school girls and the poorest 10 per cent of working girls is about 30 per cent of the entire range of the scale.

TABLE 279

CAUSE AND EFFECT — PER CENT CORRECT

Girls — 16 Years

Percentiles	X	M
L. L.	0	0
10	73.1	44.0
20	85.1	56.2
30	90.3	67.2
40	93.9	75.2
50	95.9	80.9
60	99.4	86.6
70	100.0	89.5
80	100.0	94.5
90	100.0	100.0
U. L.	100.0	100.0
No. of Cases	239	295
Median	95.9±.5 P. E.	80.9±1.1 P. E.
Q	6.2	15.2

TABLE 280

CAUSE AND EFFECT — PER CENT CORRECT: DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls — 16 Years

Percentiles	
10	29.1
20	28.9
30	23.1
40	18.7
50	15.0
60	12.8
70	10.5
80	5.5
90	0

Construction Puzzles

The ten-percentile norms for the six construction puzzles given at years sixteen, seventeen, and eighteen are presented in Table 281 for school boys (X) and working boys (M) separately. The differences between the percentiles for school boys and those for working boys (X-M) are given in Table 282. The various puzzles differed widely in difficulty. The order of difficulty, judged by the percentile tables, is as follows: flower-pot, chick, boat, cradle, seal, egg. All of them except the flower-pot were difficult enough to cause failure in from 10 to 60 per cent of every group. No comparisons of ability from year to year can be made because of the wide variations in difficulty of the parts of the test.

The percentiles show a clear superiority of school boys over working boys in every test except that of the egg, given at sixteen years. This test, which has 60 per cent failure both among school and among working boys, gives an advantage to the working boys in the upper percentiles.

The presence of so large a proportion of failures, which set an arbitrary limit of three hundred or more to the percentile ratings, invalidates the comparison of percentiles except for the parts of the scale in which both school and working boys have time records indicating success. Comparisons of the two groups can also be made on the basis of proportion of failures. In the chick puzzle 10 per cent of the school boys and 30 per cent of the working boys failed. In the boat puzzle 20 per cent of the school boys and 30 per cent of the working boys failed; in the cradle puzzle 20 per cent of the school boys and 50 per cent of the working boys failed; in the seal puzzle 50 per cent of the school boys and 60 per cent of the working boys failed.

In the table of differences (Table 282) the brackets indicate the part of the scale in which valid comparisons of percentiles can be made. The superiority of the school boys, in every instance except the egg puzzle, is evident. It is also striking that the differences become less as the upper part of the scales is approached. The ninety-percentile difference is the smallest in every instance, and the differences become large at each step so long as valid comparisons can be made. In other words, in this instance also, the difference in ability to perform the test is less between good school boys and good working boys than between poor school boys and poor working boys.

The ten-percentile norms for girls for the six construction puzzles are presented separately in Table 283. The differences between the percentiles for school girls and those for working girls (X-M) are presented in Table 284. The state of affairs is similar to that found among the boys. The comparison between school girls and working girls, stated in terms of the proportion of failure, is as follows: in the chick, 10 per cent of the school

TABLE 281 — CONSTRUCTION PUZZLES — TIME OF SOLUTION IN SECONDS

Boys

X

PERCENTILES	Egg 16 yrs.	Fl. Pot 16 yrs.	Chick 17 yrs.	Boat 17 yrs.	Cradle 18 yrs.	Seal 18 yrs.
L. L.	300+	300+	300+	300+	300+	300+
10	300+	112.4	300+	300+	300+	300+
20	300+	87.0	276.0	300+	300+	300+
30	300+	71.1	187.5	233.4	277.9	300+
40	300+	61.3	138.0	135.5	245.9	300+
50	300+	53.1	107.3	116.0	187.4	300+
60	300+	45.1	86.3	97.4	152.9	287.9
70	271.8	39.6	73.5	79.7	109.4	201.7
80	194.4	34.1	63.0	59.3	91.4	146.5
90	122.5	27.0	50.1	43.5	60.7	113.6
U. L.	25.0	16.0	29.0	30.0	30.0	60.0
No. of Cases	276	281	175	171	63	63

M

PERCENTILES	Egg 16 yrs.	Fl. Pot 16 yrs.	Chick 17 yrs.	Boat 17 yrs.	Cradle 18 yrs.	Seal 18 yrs.
L. L.	300+	300+	300+	300+	300+	300+
10	300+	187.5	300+	300+	300+	300+
20	300+	124.3	300+	300+	300+	300+
30	300+	95.3	300+	300+	300+	300+
40	300+	77.4	261.6	285.0	300+	300+
50	300+	65.4	199.2	208.6	300+	300+
60	300+	56.1	154.0	165.0	248.4	300+
70	268.7	48.7	116.1	121.7	175.4	285.1
80	180.9	41.3	87.6	85.4	128.6	214.1
90	99.0	34.1	52.1	60.9	94.8	153.1
U. L.	36.8	11.6	30.2	30.0	30.0	30.0
No. of Cases	272	320	297	248	296	267

TABLE 282 — CONSTRUCTION PUZZLES — TIME: DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

PERCENTILES	Egg 16 yrs.	Fl. Pot 16 yrs.	Chick 17 yrs.	Boat 17 yrs.	Cradle 18 yrs.	Seal 18 yrs.
10	0	75.1	0	0	0	0
20	0	37.3	24+	0	0	0
30	0	24.2	112.5+	66.6+	22.1+	0
40	0	16.1	123.6	149.7	54.1+	0
50	0	12.3	91.9	92.6	112.6+	0
60	0	11.0	68.7	67.6	95.5	12.1+
70	− 3.1	9.1	42.6	42.0	66.0	83.4
80	−13.5	7.2	24.6	26.1	37.2	67.6
90	−23.5	7.1	2.0	17.4	34.1	39.5

NOTE. The brackets indicate the part of the scale within which valid comparisons can be made.

TABLE 283 — CONSTRUCTION PUZZLES — TIME OF SOLUTION IN SECONDS

Girls

X

PERCENTILES	Egg 16 yrs.	Fl. Pot 16 yrs.	Chick 17 yrs.	Boat 17 yrs.	Cradle 18 yrs.	Seal 18 yrs.
L. L.	300+	300+	300+	300+	300+	300+
10	300+	160.9	300+	300+	300+	300+
20	300+	119.7	297.0	273.0	300+	300+
30	300+	88.1	232.8	216.9	300+	300+
40	300+	71.2	200.7	180.2	253.4	300+
50	300+	59.4	150.3	137.7	205.0	300+
60	300+	50.5	126.3	108.5	181.0	247.1
70	300+	42.3	105.0	84.8	151.9	201.4
80	232.8	35.3	76.7	68.7	120.5	152.9
90	124.9	26.8	56.5	50.7	83.9	100.4
U. L.	29.0	15.0	28.0	30.0	45.0	45.0
No. of Cases . . .	223	231	160	157	76	71

M

PERCENTILES	Egg 16 yrs.	Fl. Pot 16 yrs.	Chick 17 yrs.	Boat 17 yrs.	Cradle 18 yrs.	Seal 18 yrs.
L. L.	300+	300+	300+	300+	300+	300+
10	300+	226.3	300+	300+	300+	300+
20	300+	156.0	300+	300+	300+	300+
30	300+	118.6	300+	300+	300+	300+
40	300+	94.9	262.3	300+	300+	300+
50	300+	78.8	198.3	300+	300+	300+
60	300+	67.8	157.3	241.3	300+	300+
70	300+	58.4	119.0	164.3	212.2	300+
80	217.9	49.7	93.7	115.3	165.7	253.4
90	108.4	37.8	64.0	80.6	110.2	143.9
U. L.	32.4	16.0	33.0	30.0	45.0	30.0
No. of Cases . . .	199	261	237	186	247	158

TABLE 284 — CONSTRUCTION PUZZLES — TIME: DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls

PERCENTILES	Egg 16 yrs.	Fl. Pot 16 yrs.	Chick 17 yrs.	Boat 17 yrs.	Cradle 18 yrs.	Seal 18 yrs.
10	0	65.4	0	0	0	0
20	0	36.3	3+	27.0+	0	0
30	0	30.5	67.2+	83.1+	0	0
40	0	23.7	61.6	119.8+	49.6+	0
50	0	19.4	48.0	162.3+	95.0+	0
60	0	17.3	31.0	132.8	119.0+	52.9+
70	0	16.1	14.0	79.5	60.3	98.6+
80	−15.1	14.4	17.0	46.6	45.2	100.5
90	−16.5	11.0	7.5	29.9	26.3	43.5

NOTE. The brackets indicate the part of the scale within which valid comparisons can be made.

girls and 30 per cent of the working girls failed; in the boat, 10 per cent of the school girls and 50 per cent of the working girls failed; in the cradle, 30 per cent of the school girls and 60 per cent of the working girls failed; in the seal, 50 per cent of the school girls and 70 per cent of the working girls failed; and in the egg, 70 per cent of both school and working girls failed.

The comparison of percentiles (X-M) in the range of the scales for which it is valid (indicated in the X-M tables by brackets) also shows a marked superiority of the school girls in every test except the egg, in which, as in the case of the boys, the working group is a little superior. Among the girls also, the difference between the ninety percentiles are least of any, and the size of the difference increases steadily as the scale is descended, until the point is reached at which comparisons are no longer valid because the point of failure has been reached. Again in this instance we find, then, that the differences between superior school girls and superior working girls are less than those between inferior ones.

PUZZLE BOXES

The puzzle boxes used were the Healy and Fernald box at fifteen and sixteen, the Hayes instruction box at seventeen, and the Freeman puzzle box at eighteen. The tests differ in type. While the Healy and Fernald and Freeman boxes are distinctly tests of mechanical ingenuity, the Hayes box is rather a test in ability to understand and carry out instructions as they apply to a mechanical device. The ten-percentile scales for school boys (X) and working boys (M) separately are presented in Table 285. The differences between the percentiles for school and those for working boys (X-M) are given in Table 286. As in every other mental test, the school boys are superior in every instance to the working boys. The differences are least at the ninetieth percentile and increase as the scale is descended until the point of failure renders the numerical comparison invalid. Here again, then, there is less difference between good school boys and good working boys than between poor ones.

In the repetition of the Healy and Fernald box at sixteen, the working boys gained far more than the school boys. This probably means that a previous familiarity with an ingenuity test counts for more in the working than in the school group. No real age comparisons can be made based upon these tests, because the tests differed so much from year to year. The Hayes instruction box does not furnish a favorable basis of comparison because it could be evaluated in four steps only. Perhaps the best way of stating the difference it shows is to say that while 60 per cent of the school boys succeeded on a first trial, only 40 per cent of the working boys did so.

At sixteen years, the test with the Healy and Fernald puzzle box consisted in asking the child to open it, noting carefully all the steps he took, with a view to closing it again after he had opened it (see Chapter IV).

While the results could not be used in a scale of measurement, they furnish an added possibility of comparing school and working children. The results are summed up in Tables 287 and 288. While 44 per cent of the school boys succeeded in closing the box, only 34 per cent of the working boys did so. The median time required for those who succeeded was 251 seconds for school boys and 276 seconds for working boys. The superiority of the school boys is evident in both measures. A larger proportion of them succeeded and with less time required for the solution.

The ten-percentile scales for school girls (X) and working girls (M) are given in Table 289, and the differences between the percentiles for school girls and those for working girls (X-M) in Table 290. Here again the superiority of the school girls is striking in every instance. The differences are least in the ninetieth percentile, and increase steadily as the scale is descended until the point of failure renders the comparison invalid. Here

TABLE 285 — PUZZLE BOXES — TIME IN SECONDS

Boys

Percentiles	X				M			
	Healy-Fernald		Instruction Box No. of Trials 17 yrs.	Freeman 18 yrs.	Healy-Fernald		Instruction Box No. of Trials 17 yrs.	Freeman 18 yrs.
	15 yrs.	16 yrs.			15 yrs.	16 yrs.		
L. L.	720+	720+	Failure	300+	720+	720+	Failure	300+
10 . . .	450	291	2	300+	720+	458	Failure	300+
20 . . .	333	236	2	261	634	294	3	300+
30 . . .	263	190	2	176	465	223	2	300+
40 . . .	208	159	2	152	365	194	2	264
50 . . .	180	138	1	116	304	169	2	201
60 . . .	157	119	1	106	261	145	2	160
70 . . .	142	100	1	94	220	120	1	127
80 . . .	119	87	1	81.6	175	100	1	98
90 . . .	93	73	1	62.8	126	80	1	74
U. L.	49	37	1	30.1	45	41	1	30
No. of Cases	290	273	167	54	340	310	297	282
Median	180 ± 6.1 P.E.	138 ± 4.5 P.E.	1 ± .05 P.E.	116 ±11.1 P.E.	304 ±12.1 P.E.	169 ± 5.3 P.E.	2 ± .06 P.E.	
Q . . .	83.5	59.5	.5	65.6	176	74.5	.75	

TABLE 286 — PUZZLE BOXES: DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys

Percentiles	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	270+	167	0	0
20	301	58	1	39+
30	202	33	0	124+
40	157	35	0	112
50	124	31	1	85
60	104	26	1	54
70	78	20	0	33
80	56	13	0	16
90	33	7	0	11

TABLE 287 — PUZZLE-BOX CLOSING

Boys — 16 years

	X	M	Total
Number of successes	115	80	195
Number of failures	143	155	298
Total	258	235	493
Percentage of success	44	34	40
Percentage of failure	56	66	60

TABLE 288 — DISTRIBUTIONS: TIME FOR SUCCESS IN CLOSING

Boys

Seconds	X	M	Total
50–			
51	2	1	3
76	3	1	4
101	8	4	12
126	6	2	8
151	7	4	11
176	8	5	13
201	12	5	17
226	4	11	15
251	8	4	12
276	11	3	14
301	7	12	19
351	12	8	20
401	16	11	27
501–	11	9	20
599			
	115	80	195
Median	251	276	255

TABLE 289 — PUZZLE BOXES — TIME IN SECONDS

Girls

Percentiles	X				M			
	Healy-Fernald		Instruction Box No. of Trials 17 yrs.	Freeman 18 yrs.	Healy-Fernald		Instruction Box No. of Trials 17 yrs.	Freeman 18 yrs.
	15 yrs.	16 yrs.			15 yrs.	16 yrs.		
L. L.	720+	720+	Failure	600	720+	720+	Failure	300+
10	720+	396	3	300+	720+	720+	Failure	300+
20	704	299	2	300+	720+	641	Failure	300+
30	489	248	2	300+	720+	409	3	300+
40	394	221	1	293	712	309	3	300+
50	333	196	1	235	602	247	2	300+
60	276	167	1	187	470	198	2	296
70	224	143	1	146	386	168	2	231.6
80	175	120	1	117.3	298	133	1	175.5
90	128	92	1	91.5	227	106	1	112.0
U. L.	46	51	1	10+	95	40	1	40.1
No. of Cases	249	203	150	66	257	210	211	166

TABLE 290 — PUZZLE BOXES: DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls

Percentiles	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	0	324+	—	0
20	16+	342	—	0
30	231+	161	1	0
40	318	88	2	7+
50	269	51	1	65+
60	194	31	1	109
70	162	25	1	85.6
80	123	13	0	58.2
90	99	14	0	20.5

NOTE. The brackets indicate the part of the scale within which valid comparisons can be made.

TABLE 291 — PUZZLE-BOX CLOSING

Girls — 16 years

	X	M	Total
Number of successes	47	27	74
Number of failures	132	126	258
Total	179	153	332
Percentage of success	26	18	22
Percentage of failure	74	82	78

TABLE 292

DISTRIBUTIONS: TIME FOR SUCCESS IN CLOSING

Girls

SECONDS	X	M	Total
50–			
51			
76		1	1
101		1	1
126	1		1
151	2		2
176	3		3
201	3	3	6
226	1		1
251	4		4
276	5	2	7
301	8	2	10
351	6	4	10
401	6	9	15
501	8	5	13
599			
	47	27	74
Median	290	354	306

also, then, the difference between superior school girls and superior working girls is less than that between the inferior ones. In the repetition of the Healy and Fernald box at sixteen, the working girls, like the boys, gain much more than the school girls. Apparently for them, too, familiarity with an ingenuity type of test counts for more than in the case of the school girls. Or perhaps this is another case in which mere repetition makes more of a difference to those who had poor records on a first performance than to those who had good records. Even in routine tests, involving very little thought, the very inferior seem to gain most on repetition. In comparing school and working girls in performance of the instruction box, the fact that, while 70 per cent of the school girls opened the box on the first trial only 30 per cent of the working girls did so, states the difference strikingly. Even the poorest 10 per cent of the school girls opened the box after three trials, while 20 per cent of the working girls failed.

The results for the closing of the Healy and Fernald box at sixteen years furnish an additional basis of comparison (see Tables 291 and 292). While 26 per cent of the school girls succeeded in closing the box, only 18 per cent of the working girls did so. The median time required for the school girls who succeeded was 290 seconds, while the working girls required 354 seconds. By both measures, the school girls prove to be superior. A larger proportion of them succeed in less time than the working girls.

RECOGNITION

The ten-percentile scales for school boys (X) and working boys (M) in the recognition test are presented in Table 293. The differences between the percentiles of the school boys and those of the working boys (X-M) are given in Table 294. In this test any score is possible between the limits of +100 and −100. If every one of the twenty cards in the second pack (see Chapter IV) were wrongly judged, with the result that ten positive and ten negative errors were made, the score would be −100, since 10 per cent is deducted from a score of 100 for every error made. If all of the pack of twenty were judged correctly, the score would be 100. The median score for school boys is about 75 and for working boys about 55. In other words, school boys as a group make about two and one-half errors and working boys about four and one-half. The school boys are, then, superior to the working boys. Both school and working boys make more positive than negative errors. The superiority of the school boys is greater in terms of positive errors than it is in terms of negative errors. This difference may be interpreted as a difference in suggestibility. The working boys show a greater tendency to accept a somewhat similar drawing as exactly like the one seen before than do the school boys.

TABLE 293 — RECOGNITION

Boys — 18 years

Percentiles	X			M		
	Per Cent Correct	+Errors	−Errors	Per Cent Correct	+Errors	−Errors
L. L.	30.0	4	5	−10.0	8	6
10	47.7	3	3	31.3	6	3
20	56.5	3	2	41.6	5	2
30	63.2	2	1	48.0	4	2
40	68.7	2	1	52.6	4	2
50	74.2	1	1	56.4	3	1
60	79.7	1	0	60.2	3	1
70	84.1	1	0	65.2	3	1
80	88.5	0	0	70.2	2	1
90	90.0	0	0	77.1	1	0
U. L.	90.0	0	0	100.0	0	0
No. of Cases	66	66	66	292	292	292
Median	74.2±2.0 P. E.	1.0± .2 P. E.	1.0± .1 P. E.	56.4± .9 P. E.	3 ± .1 P. E.	1.0± .1 P. E.
Q	13.2	1.3	.8	11.5	1.3	1.0

TABLE 294

RECOGNITION — PER CENT CORRECT AND TYPE OF ERROR: DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys — 18 years

PERCENTILES	Per Cent Correct	+Errors	−Errors
10	16.4	3	0
20	14.9	2	0
30	15.2	2	1
40	16.1	2	1
50	17.8	2	0
60	19.5	2	1
70	18.9	2	1
80	18.3	2	1
90	12.9	1	0

TABLE 295

RECOGNITION

Girls — 18 years

PERCENTILES	X			M		
	Per Cent Correct	+Errors	−Errors	Per Cent Correct	+Errors	−Errors
L. L.	10.0			−10.0	10	9
10	38.3	5	2	25.9	6	3
20	52.0	4	2	33.8	5	2
30	57.6	3	1	39.5	4	2
40	63.5	3	1	46.0	4	1
50	69.6	2	0	52.5	3	1
60	74.0	2	0	58.9	3	1
70	78.3	1	0	63.6	2	0
80	82.6	1	0	67.9	2	0
90	86.9	0	0	76.2	1	0
U. L.	90.0	0	0	90.0	0	0
No. of Cases	73	73	73	204	204	204
Median	69.6±2.4 P. E.	2.0± .2 P. E.	0 ± .1 P. E.	52.5±1.3 P. E.	3 ± .1 P. E.	1 ± .1 P. E.
Q	16.9	1.3	.8	14.6	1.3	1.0

TABLE 296

RECOGNITION—PER CENT CORRECT AND TYPE OF ERROR: DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls — 18 years

Percentiles	Per Cent Correct	+Errors	−Errors
10	12.4	1	1
20	18.2	1	0
30	18.1	1	1
40	17.5	1	0
50	17.1	1	1
60	15.1	1	1
70	14.7	1	0
80	14.7	1	0
90	10.7	1	0

The percentile scales of the recognition test for girls are given in Table 295 for school girls (X) and working girls (M) separately. The differences between the scale for school girls and that for working girls (X-M) are given in Table 296. The school girls are superior to the working girls. The median record for school girls is about 70, and for working girls about 50. The school girls as a group make three errors and the working girls five out of the twenty judgments. As in the case of the boys, positive errors are more common in both groups than negative ones. The difference between school girls and working girls is somewhat greater in terms of positive than of negative errors. In other words, the working girls seem slightly more suggestible than the school girls—as well as less accurate.

AUSSAGE

The only measure of the *Aussage* test which has been summed up in percentile scales is that of the percentage of correct ideas. The ten-percentile scales for school boys (X) and working boys (M) separately are presented in Table 297. The differences between the percentiles for the school boys and those for the working boys (X-M) are given in Table 298. The usual relationship holds. School boys are superior to working boys. The difference between the two groups is least at the top of the percentile scales and increases as the scales are descended. In other words, there is in this test also a greater contrast between inferior school boys and inferior working boys than there is between superior members of the two groups. In this test the time factor does not enter in. Superiority is stated merely in terms of accuracy of report, in a case in which a perfect accuracy would be conceivable, though not attained by any subject.

TABLE 297 — AUSSAGE — PER CENT CORRECT IDEAS

Boys — 18 years

PERCENTILES	X	M
L. L.	4.0	4.0
10	52.0	41.3
20	57.4	47.5
30	61.6	53.9
40	64.9	58.1
50	67.2	61.5
60	68.9	64.4
70	70.7	67.8
80	77.0	72.4
90	82.7	79.1
U. L.	95.0	95.0
No. of Cases	60	295
Median	67.2±1.2 P. E.	61.5±.7 P. E.
Q	7.2	9.7

TABLE 298

AUSSAGE — PER CENT CORRECT IDEAS: DIFFERENCES BETWEEN THE PERCENTILE SCALES (X-M)

Boys — 18 years

PERCENTILES	
10	10.7
20	9.9
30	7.7
40	6.8
50	5.7
60	4.5
70	2.9
80	4.6
90	3.6

TABLE 299 — AUSSAGE — NUMBER OF INSERTIONS

Boys — 18 years

INSERTIONS	X	M	Total
1	13	93	106
2	10	47	57
3	5	16	21
4	1	4	5
5		1	1
6	1	1	2
7		1	1
8	1		1
9			
No. of Cases	31	163	194
No. of Insertions	66	271	337
Total No. of Cases	60	295	355
Per Cent of Total Cases Showing Insertions	52	55	55
Average No. of Insertions per Person	2.1	1.7	1.7

In recording the test, the number of items inserted in the report which were not part of the original text was noted. Table 299 sums up the facts about these insertions. About half, both of school and of working boys, insert items in the report which were not in the original account. The percentage is somewhat higher for working than for school boys (55 per cent as against 52 per cent). However, the average number of insertions per person is higher for the school than for the working boys. While fewer school than working boys embroider the report, those who do put on a somewhat more elaborate pattern. In either cases, however, the average number of insertions is small—1.7 for working boys and 2.1 for school boys. Out of 194 boys who made insertions, only 5 inserted more than four items.

TABLE 300

AUSSAGE — PER CENT CORRECT IDEAS

Girls — 18 years

PERCENTILES	X	M
L. L.	41.0	4.0
10	47.4	32.7
20	57.4	41.6
30	62.7	47.6
40	65.2	52.3
50	68.9	56.4
60	71.7	62.4
70	74.3	68.0
80	78.6	72.5
90	84.0	77.8
U. L.	100.0	95.0
No. of Cases	77	201
Median	68.9±1.2 P. E.	56.4±1.3 P. E.
Q	8.2	14.2

TABLE 301

AUSSAGE — PER CENT CORRECT IDEAS: DIFFERENCES BETWEEN TEN-PERCENTILE SCALES (X-M)

Girls — 18 years

PERCENTILES	
10	14.7
20	15.8
30	15.1
40	12.9
50	12.5
60	9.3
70	6.3
80	6.1
90	6.2

TABLE 302

AUSSAGE — NUMBER OF INSERTIONS

Girls — 18 years

Insertions	X	M	Total
1	13	65	78
2	16	34	50
3	5	7	12
4	1	3	4
5		1	1
6			
7			
8	2		2
9		1	1
No. of Cases	37	111	148
No. of Insertions	80	180	260
Total No. of Cases	77	201	278
Per Cent of Total Cases Showing Insertions	48	55	53
Average No. of Insertions per Person	2.2	1.6	1.7

The ten-percentile scales for school girls (X) and working girls (M) are given in Table 300. The differences between the percentiles for school girls and those for working girls (X-M) are given in Table 301. In general, the relationship is the same as in the case of the boys. School girls are superior to working girls. The differences between the two groups is least in the upper percentiles of the scale and increases as the scale is descended. Once again, then, the contrast between inferior school girls and inferior working girls is greater than that between the superior members of the two groups. This is one of the few instances in which the difference between school girls and working girls is greater than the difference between school boys and working boys.

Table 302, giving the number of items inserted in the report which were not present in the original, shows a state of affairs similar to that of the boys. There is a smaller proportion of working than of school girls who insert items (48 per cent as against 55 per cent), but those who do make insertions insert, on the average, more items. The number of insertions is in either case small—2.2 for school girls and 1.6 for working girls. Out of 148 girls who made insertions, only 4 inserted more than four items. Failure in this test is chiefly in terms of failure to remember and very little in terms of falsification of report.

TABLE 303 — HARD DIRECTIONS

Boys — 18 years

Percentiles	X		M	
	Time	Number Correct	Time	Number Correct
L. L.	361.0	7	541.0	0
10	239.5	16	426.4	9
20	207.0	17	350.2	10
30	180.6	17	298.6	12
40	168.6	18	269.1	13
50	153.6	18	249.4	15
60	142.0	19	226.9	15
70	129.0	19	205.0	16
80	114.1	19	183.8	17
90	103.5	20	157.0	18
U. L. . . .	92.0	20	105.0	20
No. of Cases	64	65	294	294
Median . .	153.6±5.6 P. E.	18±.2 P. E.	249.4±4.7 P. E.	15±.2 P. E.
Q	36.1	1	65.0	2.8

HARD DIRECTIONS

The Woodworth and Wells hard-directions test was used at eighteen years. The ten-percentile norms for school boys (X) and working boys (M) in terms of time in seconds for the entire test and number of directions correctly carried out are presented in Table 303. The differences between school boys and working boys (X-M) are given in Table 304. The usual relationship holds. School boys have records very superior to those of the working boys, both in the speed with which the test was performed and in its correctness. The differences are smallest in the upper percentiles of the scale and grow steadily greater as the scale is descended. Once more, then, the difference between school boys of poor ability and working boys of poor ability is much greater than the difference between school boys of good ability and working boys of good ability.

The ten-percentile scales for school girls (X) and working girls (M) in the hard-directions test are given in Table 305. The differences between the percentiles of school girls and those of working girls are given in Table 306. The relationship is the same as in the case of the boys. School girls are superior to working girls both in the speed with which the test is performed and in its correctness. Among the girls also the difference between superior school girls and superior working girls is less than that between inferior school girls and inferior working girls. There is a steady increase in the size of the difference from the top to the bottom of the scale.

TABLE 304

HARD DIRECTIONS — TIME IN SECONDS AND NUMBER CORRECT: DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys — 18 years

Percentiles	Time	Number Correct
10	186.9	7
20	143.2	7
30	118.0	5
40	100.5	5
50	95.8	3
60	84.6	4
70	76.0	3
80	69.7	2
90	53.5	2

TABLE 305 — HARD DIRECTIONS

Girls — 18 years

Percentiles	X		M	
	Time	Number Correct	Time	Number Correct
L. L.	420.0	11	848.0	7
10	244.0	16	348.4	11
20	217.0	17	293.4	13
30	184.6	18	262.3	14
40	167.4	18	239.5	15
50	141.6	19	220.2	16
60	130.3	19	202.3	16
70	120.9	19	180.6	17
80	115.9	20	165.5	18
90	111.0	20	141.6	19
U. L.	80.0	20	95.0	20
No. of Cases	76	77	198	200
Median	141.6±5.9 P. E.	19±.1 P. E.	220.2±4.6 P. E.	16±.2 P. E.
Q	41.2	1.0	52.4	2.0

TABLE 306

HARD DIRECTIONS — TIME IN SECONDS AND NUMBER CORRECT: DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls — 18 years

Percentiles	Time	Number Correct
10	104.4	5
20	76.4	4
30	77.7	4
40	72.1	3
50	78.6	3
60	72.0	3
70	59.7	2
80	49.6	2
90	30.6	1

YERKES POINT SCALE

Although the Yerkes Point Scale records for the working group are doubtless a trifle too low, because 60 per cent of those tested were below average on the scale of average percentile ranks, it is nevertheless interesting to see how great the contrast is between the working and the school groups. The ten-percentile distributions of the score for working and school boys separately at the age of eighteen years are given in Table 307, and the difference between the two groups in Table 308. The median score for school boys is 92.5 and for the working boys 78.7. The school boys thus have a score fourteen points above the working group. The superiority of low-grade school boys to low-grade working boys is much greater than the superiority of high-grade school boys to high-grade working boys. The

TABLE 307

YERKES POINT SCALE—POINT SCORE

Boys — 18 years

PERCENTILES	X	M
10	85.8	65.6
20	87.9	70.5
30	89.9	73.1
40	91.2	75.8
50	92.5	78.7
60	93.8	80.9
70	95.1	82.7
80	96.8	84.5
90	98.4	88.1
No. of Cases	49	159

TABLE 308

YERKES POINT SCALE: DIFFERENCES IN POINTS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Boys — 18 years

PERCENTILES	
10	20.2
20	17.4
30	16.8
40	15.4
50	13.8
60	12.9
70	12.4
80	12.3
90	10.3

difference between the ten percentiles is 20, while the difference between the ninety percentiles is only 10.

The corresponding ten-percentile scales for school girls and working girls is given in Table 309 and the difference between the percentile scales for school and those for working girls in Table 310. The superiority of the school girls is very evident. The median score of school girls is 92.3 and that of working girls 79.7. The school girls are thus twelve and one-half points above the working girls in score. While the contrast between low-grade working girls and low-grade school girls is even greater than in the case of the boys, the contrast between high-grade school girls and high-grade working girls is less. The difference between the ten percentiles in the case of the girls is 24.6, where it was 20.2 in the case of the boys, while the difference between the ninety percentiles is 6.4 in the case of the girls, but 10.3 in the case of the boys.

TABLE 309

YERKES POINT SCALE—POINT SCORE

Girls — 18 years

Percentiles	X	M
10	86.1	61.5
20	88.7	68.6
30	90.4	72.9
40	91.4	76.4
50	92.3	79.7
60	93.2	82.2
70	94.2	84.5
80	95.2	87.6
90	97.6	91.2
No. of Cases	43	114

TABLE 310

YERKES POINT SCALE: DIFFERENCES IN POINTS BETWEEN THE TEN-PERCENTILE SCALES (X-M)

Girls — 18 years

Percentiles	
10	24.6
20	20.1
30	17.5
40	15.0
50	12.6
60	11.0
70	9.7
80	7.6
90	6.4

Summary of Differences in Mental Tests between School and Working Children

To arrive at a convenient summary of the outcome of the comparison of school boys and working boys in mental tests, the same procedure has been followed as in the physical tests. The median record of each age and sex group in each mental test has been ranked on the general scale. The percentile ranks of these medians for school boys (X) and working boys (M) separately are given in Table 311. The differences between the ranks of the median school boys and those of the median working boys are given in Table 312.

The table of differences shows at once the superiority of the school boys in every type of test. There are two instances of superiority of working boys. One is a slight superiority in accuracy on the learning page of the substitution at year fourteen—a difference too small to be significant—and the other a superiority in seven-place memory at year sixteen—an anomaly which we are quite unable to explain. In the more routine type of tests such as memory and cancellation, the differences between school and working boys are relatively smaller. For the most part they range between ten and twenty percentiles of the scale for memory, and between ten and twenty-five percentiles for cancellation. Substitution shows variable differences, most of them falling in the range from twenty to thirty-five percentiles. The puzzle boxes and construction puzzles give a highly variable range of differences, from thirteen percentiles as the least to forty as the most. The logical association and verbal thought tests give universally large differences, falling in the range from thirty to forty percentiles.

Not only are the school boys superior, but their superiority increases from year to year and is decidedly greater at eighteen than it was at fourteen. The tests showing least gain from year to year in the lead of the school boys are memory and cancellation, two of the most routine types of test. The degree of difference is less for immediate routine memory than for any other type of test. It is also comparatively small for logical memory (*Aussage*). The greatest gain in lead of the school boys in the tests for which we have yearly records is in substitution. The degree of difference between working and school boys is greatest in the hard directions, association by opposites, cause and effect, and mutilated text. These tests all involve both the use and interpretation of language, and logical thinking. In the performance tests the difference, while large, is less than that for tests involving both logical thinking and the use of language.

Taking all the differences in percentile rank for the various years and elements of the test into consideration, the tests arrange themselves from those showing least difference between working and school boys to those showing most difference in the order given on page 316.

TABLE 311

MENTAL TESTS: PERCENTILE RANK OF SCHOOL AND WORKING MEDIANS

Boys

	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
Cancellation										
Index	51	66	59	56	68	49	38	43	45	46
Accuracy . .	62	59	59	59	57	38	44	42	49	48
Substitution										
Index, Page 1	59	69	68	69	79	38	35	40	39	43
Index, Page 2	60	70	63	66	76	41	40	41	42	44
Index, Page 3	56	65	60	56	75	46	38	42	47	46
Index, Page 4	55	64				45	43			
Accuracy . .	50	50	52	61	80	52	50	49	50	47
Sum	59	70	66	68	82	40	35	39	39	43
Memory										
7-Place . . .	55	56	55	55	60	46	44	69	45	50
8-Place . . .	55	58	55	60	63	45	44	47	44	47
9-Place . . .	54	55	59	62	59	44	45	43	44	47
Sum	55	60	61	63	60	46	43	42	43	48
Sentence Completion										
Index of Ideas	59	69	69			44	37	33		
No. of Ideas .	62	43	58			27	42	40		
Association Time . . .	54	60	59			48	41	35		
No. Correct .	65	68	70			35	45	32		
Mutilated Text										
Time				68	77				39	45
Accuracy . .				75	75				35	42
Opposites										
Easy	62	61			76	29	31			33
Hard				76	66				35	33
Cause and Effect . . .			70					31		
Construction Puzzles										
Flower-Pot .			57					43		
Chick				64					42	
Boat				63					41	
Cradle . . .					68					25
Puzzle Boxes .		67	57	80	70		40	44	40	46
Recognition										
Per Cent Correct . .					91					65
Plus Errors .					80					40
Minus Errors					50					50
Aussage					65					46
Hard Directions										
Time					84					43
Number Correct . .					85					50
Yerkes Point Scale					85					35

TABLE 312

MENTAL TESTS: DIFFERENCES BETWEEN THE PERCENTILE RANKS OF SCHOOL AND WORKING MEDIANS (X-M)

	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
Cancellation					
Index	2	28	16	11	22
Accuracy	24	15	17	10	9
Substitution					
Index, Page 1	21	34	28	30	36
Index, Page 2	19	30	22	24	32
Index, Page 3	10	27	18	9	29
Index, Page 4	10	21			
Accuracy	−2	0	3	11	33
Sum	19	35	27	29	39
Memory					
7-Place	9	12	−14	10	10
8-Place	10	14	8	16	16
9-Place	10	10	16	18	12
Sum	9	17	19	20	12
Sentence Completion					
Index of Ideas	15	32	36		
Number of Ideas	35	1	18		
Association Time	6	19	24		
Number Correct	30	23	38		
Mutilated Text					
Time				29	32
Accuracy				40	33
Opposites					
Easy	33	30			43
Hard				41	33
Cause and Effect			39		
Construction Puzzles					
Flower-Pot			14		
Chick				22	
Boat				22	
Cradle					33
Puzzle Boxes		27	13	40	24
Recognition					
Per Cent Correct					26
Plus Errors					40
Minus Errors					0
Aussage					19
Hard Directions					
Time					41
Number Correct					35
Yerkes Point Scale					50

memory
cancellation
Aussage
substitution
completion of sentences
construction puzzles
recognition
mechanical puzzles
mutilated text
association by opposites
cause and effect
hard directions

To sum up differences in the scale of mental ability, the average percentile ranks in mental tests for school boys (X) and working boys (M) separately have been arranged in percentile scales in Table 313. The differences between these two percentile scales are shown in Table 314. It is evident at a glance that the two groups differ from one another in mental ability more and more widely from year to year between the ages of fourteen and eighteen. The course of events in mental ability is the reverse from that in physical ability, in which the two groups tend to approach one another between the ages of fourteen and eighteen. There is more difference between inferior school boys and inferior working boys than there is between superior ones. By eighteen years of age the best of the working boys are only about ten percentiles below the best of the school boys, while the poorest working boys are about thirty percentiles below the poorest school boys.

The corresponding comparisons for girls, based upon the use of the percentile ranks, are as follows:

The percentile rank on the general scale of the median record of school girls (X) and of working girls (M) in each test and at each age is shown in Table 315. The difference between the percentile rank of the median school girl and that of the median working girl in each test and at each age is shown in Table 316. The superiority of the school girls over the working girls is consistent and striking. The only instances of superiority on the part of the working girl are in index of cancellation (years fourteen, seventeen and eighteen), and in memory, seven-place series (year sixteen).

Not only are the school girls superior at every age but their degree of superiority increases from fourteen to eighteen. Cancellation and rote memory display least difference, and association by opposites, cause and effect, mutilated text, and hard directions most difference. The greatest gain in superiority from year to year among the tests for which we have successive annual records, takes place in the substitution test—as it did among the boys. The tests showing, on the whole, least difference are, then,

TABLE 313

MENTAL TESTS: SCALE OF AVERAGE PERCENTILE RANKS

Boys

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs	17 yrs.	18 yrs.
10	39.1	39.0	44.5	48.8	59.5	24.3	27.2	26.8	29.7	31.8
20	43.6	50.4	50.0	54.2	63.6	31.2	32.7	32.3	33.3	38.6
30	50.3	54.4	54.1	60.2	66.7	36.4	36.6	36.8	37.4	43.2
40	55.1	58.0	58.5	65.1	69.5	42.1	40.4	40.5	41.3	47.6
50	59.5	61.7	62.5	67.2	72.1	46.9	44.2	44.5	44.7	51.8
60	63.5	65.5	66.2	69.3	74.7	51.2	47.9	48.7	49.0	56.1
70	67.1	69.6	69.6	72.5	77.7	56.2	52.1	52.8	53.7	60.2
80	71.0	74.4	73.8	76.6	80.6	62.2	56.8	56.2	59.1	66.2
90	77.8	77.8	78.5	82.0	83.0	70.6	63.4	64.8	65.7	73.3
No. of Cases	430	296	290	176	67	441	389	347	311	303
Median	59.5± .7 P.E.	61.7± .7 P.E.	62.5± .7 P.E.	67.2± .9 P.E.	72.1±1.1 P.E.	46.9± .7 P.E.	44.2± .6 P.E.	44.5± .7 P.E.	44.7± .7 P.E.	51.8± .8 P.E.
Q	11.1	9.8	9.8	9.5	7.0	12.7	9.9	10.0	10.5	11.2

TABLE 314

MENTAL TESTS: DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES OF AVERAGE PERCENTILE RANK (X-M)

Boys

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	14.8	11.8	17.7	19.1	27.7
20	12.4	17.7	17.7	20.9	35.0
30	13.9	17.8	17.3	22.8	23.5
40	13.0	17.6	18.0	23.8	21.9
50	12.6	17.5	18.0	22.5	20.3
60	12.3	17.6	17.5	20.3	18.6
70	10.9	17.5	16.8	18.8	17.5
80	8.8	17.6	17.6	17.5	14.4
90	7.2	14.4	13.7	16.3	9.7

TABLE 315

MENTAL TESTS: PERCENTILE RANK OF SCHOOL AND WORKING MEDIANS

Girls

	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
Cancellation										
Index	46	55	52	47	47	54	45	49	53	49
Accuracy . .	63	50	72	69	54	39	49	44	43	47
Substitution										
Index, Page 1	55	67	63	71	71	45	40	40	39	42
Index, Page 2	56	63	68	65	65	44	39	42	40	44
Index, Page 3	53	63	57	60	58	47	40	45	43	42
Index, Page 4	53	61				46	44			
Accuracy . .	53	50	52	63	63	48	51	49	47	46
Sum	54	64	64	74	71	46	39	41	34	43
Memory										
7-Place . . .	55	51	55	59	55	46	48	65	44	45
8-Place . . .	51	55	54	61	60	47	46	50	43	45
9-Place . . .	57	53	57	58	63	43	47	47	44	44
Sum	56	50	56	60	63	44	49	46	43	45
Sentence Completion										
Index of Ideas	56	66	70			47	38	36		
No. of Ideas .	75	45	62			24	47	36		
Association Time . . .	58	67	52			44	43	48		
No. Correct	65	60	60			38	38	33		
Mutilated Text										
Time				67	69				37	40
Accuracy . .				76	79				32	35
Opposites										
Easy	64	64			85	31	38			33
Hard				78	67				32	27
Cause and Effect			68					35		
Construction Puzzles . .										
Flower-Pot .			60					47		
Chick . . .				62					46	
Boat				63					35	
Cradle . . .					69					30
Puzzle Boxes .		63	55	80	64		20	40	45	30
Recognition										
Per Cent Correct . . .					87					60
Plus Errors .					70					45
Minus Errors					80					40
Aussage					66					41
Hard Directions										
Time					78					41
Number Correct . .					85					50
Yerkes Point Scale					80					37

TABLE 316

MENTAL TESTS: DIFFERENCES BETWEEN THE PERCENTILE RANKS OF SCHOOL AND WORKING MEDIANS (X-M)

Girls

	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
Cancellation					
Index	−8	10	3	−6	−2
Accuracy	24	1	28	26	7
Substitution					
Index, Page 1	10	27	23	32	29
Index, Page 2	12	24	26	25	21
Index, Page 3	6	23	12	17	16
Index, Page 4	7	17			
Accuracy	5	−1	3	16	17
Sum	8	25	23	40	28
Memory					
7-Place	9	3	−10	15	10
8-Place	4	9	4	18	15
9-Place	14	6	10	14	19
Sum	12	1	10	17	18
Sentence Completion					
Index of Ideas	9	28	34		
Number of Ideas	51	2	26		
Association Time	14	24	4		
Number Correct	27	22	27		
Mutilated Text					
Time				30	29
Accuracy				44	44
Opposites					
Easy	33	26			47
Hard				43	40
Cause and Effect			33		
Construction Puzzles					
Flower-Pot			13		
Chick				16	
Boat				28	
Cradle					39
Puzzle Boxes		43	15	35	34
Recognition					
Per Cent Correct					27
Plus Errors					35
Minus Errors					40
Aussage					25
Hard Directions					
Time					37
Number Correct					35
Yerkes Point Scale					43

those of a routine type requiring only mechanical efficiency, such as cancellation, rote memory, and substitution. Those showing the greatest degree of difference are those involving the use and interpretation of language and logical association processes, such as hard directions, mutilated text, and association by opposites. The performance and mere language tests fall between these limits. The order of tests, arranged from those showing least difference, on the whole, between working and school girls to those showing most difference, is as follows:

cancellation
memory
substitution
sentences
Aussage
construction puzzles
recognition
mechanical puzzles
cause and effect
hard directions
mutilated text
association by opposites

To sum up in one set of measures the differences in mental tests between school girls and working girls, the scale of average percentile ranks for the two groups separately has been prepared in Table 317. The difference between the scale for school girls and that for working girls (X-M) is presented in Table 318. The table of differences shows at a glance that school girls are decidedly superior in mental ability at every age and that their degree of superiority rises from year to year. It is greater at eighteen than it was at fourteen. There is, on the whole, more difference between inferior school girls and inferior working girls than between superior school girls and superior working girls, though this tendency is not as marked as among the boys.

Factors Which Might Be in Part Responsible for Differences in Mental Measurements between Working and School Children

In considering the explanation for the differences in mental level which have been so clearly demonstrated between school children and working children, two factors which may modify the result must first be taken into consideration as in the case of the physical tests. We must know to what extent the introduction of a new set of school children at sixteen years modified the comparison of the original groups, and we must know to what extent the omissions from year to year modified the outcome. Each year some cases were lost from the working series and still more from the school

TABLE 317

MENTAL TESTS: SCALE OF AVERAGE PERCENTILE RANKS

Girls

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	37.3	39.9	40.0	49.0	52.9	25.8	25.9	25.1	24.8	29.5
20	44.2	46.1	47.2	54.5	57.5	33.6	32.0	32.8	30.2	35.3
30	50.7	50.1	54.5	60.0	61.9	38.4	37.3	37.4	35.8	41.1
40	55.2	54.4	58.7	64.0	66.5	43.1	41.6	42.0	39.9	45.0
50	59.2	59.8	61.8	67.4	70.3	47.6	44.7	45.6	44.4	48.8
60	63.2	63.3	64.6	70.8	72.7	52.0	48.7	49.4	48.2	52.5
70	67.5	67.2	68.2	74.6	75.0	56.7	53.7	54.4	52.2	56.7
80	71.8	71.9	73.6	77.9	78.4	62.9	58.9	60.1	57.7	63.0
90	77.2	77.5	81.5	81.8	85.7	69.6	64.3	65.9	64.6	68.4
No. of Cases . .	330	256	241	162	80	334	286	294	245	205
Median	59.2± .8 P.E.	59.8± .8 P.E.	61.8± .7 P.E.	67.4± .9 P.E.	70.3±1.2 P.E.	47.6± .8 P.E.	44.7± .8 P.E.	45.6± .8 P.E.	44.4± .9 P.E.	48.8± .9 P.E.
Q	11.4	10.8	10.0	9.5	8.5	11.9	10.8	11.1	11.0	10.9

TABLE 318

MENTAL TESTS: DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES OF AVERAGE PERCENTILE RANK (X-M)

Girls

PERCENTILES	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	11.5	14.0	14.9	24.2	23.4
20	10.6	14.1	14.4	24.3	22.2
30	12.3	12.8	17.1	24.2	20.8
40	12.1	12.8	16.7	24.1	21.5
50	11.6	15.1	16.2	23.0	21.5
60	11.2	14.6	15.2	22.6	20.2
70	10.8	13.5	13.8	22.4	18.3
80	8.9	13.0	13.5	20.2	15.4
90	7.6	13.2	15.6	17.2	17.3

series. If forces were at work such that the cases lost from year to year came predominatingly from the upper or the lower part of the scale, our judgment of the meaning of the yearly changes would be different from what it would be were the omissions found equally distributed throughout the scale.

To test the first point, that of the difference due to the introduction of a new, differently selected, and unpracticed group of school children (see Chapter II) at sixteen years, the average percentile ranks in mental tests for the two school series (X_1 who began at fourteen, and X_2 who began at sixteen) were formulated separately in ten-percentile scales at year sixteen, seventeen, and eighteen. The results, with the corresponding table of differences, are given for boys in Table 319 and for girls in Table 320. The results show, in the case of the boys, differences which are very small in comparison to the size of the difference between working and school boys. The median difference is between two and two and one-half points each year, whereas the median difference between working and school boys ranges from eighteen to twenty-two and one-half points.

The school boys of the X_2 series were slightly inferior to X_1 at sixteen years, but slightly superior at seventeen and eighteen. One can conclude, therefore, that the general effect of the introduction of the new series of boys on the comparison of working and school boys was so slight as to be negligible. One interesting point in the comparison is that whereas the X_2 series is uniformly and increasingly superior to X_1 at the ten-percentile level, the X_1 series is uniformly though decreasingly superior to X_2 at the eighty- and ninety-percentile levels. In other words, the X_2 group contained few boys as stupid as the poorest of X_1. On the other hand, it contained fewer of the very bright boys than X_1.

In the case of the girls the difference between X_1 and X_2 is somewhat greater and is uniformly in favor of X_2. The median difference is 1.4 at sixteen years, 5.6 at seventeen years, and 7.7 at eighteen years. Since the corresponding differences between working and school series were 16.2, 23.0, and 21.5, the slight superiority of X_2 girls cannot be given much weight in interpreting the difference between the two series. The superiority of the X_2 girls is greater in the lower than in the upper percentiles. In other words, the X_2 series contained fewer inferior individuals than X_1. On the other hand, it did not have many more superior ones than X_1.

The omissions for each year (Table 321) are stated in terms of the school-grade classification at fourteen years and the average percentile rank of the child in the last test given him. The table of average percentile ranks used in this instance is that of the child's own group, not the combined group. School children are rated on the basis of percentile ranks for the school group, and working children on the basis of percentile ranks for the working group, since what we wish to judge is whether there is a difference

TABLE 319 — MENTAL TESTS: AVERAGE PERCENTILE RANKS

Boys

PERCENTILES	X_1			X_2			$X_2—X_1$		
	16 yrs.	17 yrs.	18 yrs.	16 yrs.	17 yrs.	18 yrs.	16 yrs.	17 yrs.	18 yrs.
10	43.9	45.8	41.0	44.5	51.9	60.7	+0.6	+6.1	+19.7
20	49.9	52.0	62.7	50.5	57.6	63.9	+0.6	+5.6	+ 1.2
30	53.8	57.4	66.1	55.4	63.0	67.4	+1.6	+5.6	+ 1.3
40	59.0	62.0	68.5	58.5	66.0	70.8	−0.5	+4.0	+ 1.3
50	63.9	65.8	70.9	61.7	68.0	73.2	−2.2	+2.2	+ 2.3
60	67.7	68.4	73.1	64.7	70.0	75.5	−3.0	+1.6	+ 2.4
70	71.5	71.9	76.5	68.0	73.1	77.6	−3.5	+1.2	+ 1.1
80	76.1	77.0	81.0	71.5	76.6	79.7	−4.6	−0.4	− 1.3
90	80.2	83.1	83.0	75.5	80.6	82.7	−4.7	−2.5	− 0.3

TABLE 320 — MENTAL TESTS: AVERAGE PERCENTILE RANKS

Girls

PERCENTILES	X_1			X_2			$X_2—X_1$		
	16 yrs.	17 yrs.	18 yrs.	16 yrs.	17 yrs.	18 yrs.	16 yrs.	17 yrs.	18 yrs.
10	35.8	46.3	51.2	44.3	53.2	54.0	+8.5	+6.9	+2.8
20	44.2	51.1	56.2	50.0	57.9	60.4	+5.8	+6.8	+4.2
30	53.1	55.9	59.3	56.4	62.7	53.9	+3.3	+6.8	+4.6
40	57.8	61.3	65.7	60.3	66.9	68.5	+2.5	+5.6	+2.8
50	61.3	64.6	68.8	62.7	70.2	71.5	+1.4	+5.6	+2.7
60	64.3	67.5	71.6	65.0	73.6	73.6	+ .7	+6.1	+2.0
70	68.1	70.7	74.2	68.2	76.5	75.9	+ .1	+5.8	+1.7
80	74.4	75.7	78.3	72.5	79.0	78.5	−1.9	+3.3	+0.2
90	80.6	80.7	83.9	82.0	82.7	86.0	+1.4	+2.0	+2.1

TABLE 321 — DISTRIBUTIONS: OMISSIONS — MENTAL TESTS AVERAGE PERCENTILE RANK X ON X SCALE, M ON M SCALE

Boys

15 YEARS

PERCENTILES	X					M				
	Grade V	Grade VI	Grade VII	Grade VIII	Total	Grade V	Grade VI	Grade VII	Grade VIII	Total
10 . . .	9	5	1		15	3	1			4
20 . . .	3	8	2	2	15	1	1	1	1	4
30 . . .	10	4			14	1	1			2
40 . . .	3	6	8	4	21	3				3
50 . . .	4	3	5	1	13	2	6	1		9
60 . . .	5	10	7	1	23	3	3		1	7
70 . . .	1	2	8		11		3			3
80 . . .		3	3		6		3		1	4
90 . . .		3	5	3	11	1			6	7
100 . . .			2	4	6					
No. of Cases	35	44	41	15	135	14	18	2	9	43
Median .					43					51

TABLE 321—*Continued*

16 YEARS

PERCENTILES	X					M				
	Grade V	Grade VI	Grade VII	Grade VIII	Total	Grade V	Grade VI	Grade VII	Grade VIII	Total
10 . . .	12	5			17	4	2			6
20 . . .	11	6	1	2	20	6	2	2		10
30 . . .	4	5	1	1	11	4		2		6
40 . . .	2	6	4	3	15	1	1	2		4
50 . . .	2	6	8	1	17	1	2	2		5
60 . . .	2	5	4	2	13	2	2	3		7
70 . . .	3		1	1	5		1	1		2
80 . . .		2	4	3	9	1		3		4
90 . . .	1	2	2	2	7	2		3		5
100 . . .		4	6	3	13	2	1		1	4
No. of Cases	37	41	31	18	127	23	11	18	1	53
Median .					42					43

17 YEARS

PERCENTILES	X					M				
	Grade V	Grade VI	Grade VII	Grade VIII	Total	Grade V	Grade VI	Grade VII	Grade VIII	Total
10 . . .	5	4	2	2	13	3	5	1		9
20 . . .		3	1	1	5	5	4			9
30 . . .	1	1		2	4	1	2	1	1	5
40 . . .			1	5	6	3	2	3		8
50 . . .			2	3	5	3	2	4	1	10
60 . . .	1	1	1	3	6		1	2		3
70 . . .	1		3	3	7	2	4		2	8
80 . . .			2	1	3	1	2	2	2	7
90 . . .		1	4	6	11					
100 . . .			1	7	8	1		2	1	4
No. of Cases	8	10	17	33	68	19	22	15	7	63
Median .					53					42

18 YEARS

PERCENTILES	X					M				
	Grade V	Grade VI	Grade VII	Grade VIII	Total	Grade V	Grade VI	Grade VII	Grade VIII	Total
10 . . .	2	5	4	1	12	4	3		1	8
20 . . .	2	3	5		10		1			1
30 . . .	1	5	2	4	12	1	1			2
40 . . .		1	2	7	10	4			1	5
50 . . .			2	5	7	2	3	1		6
60 . . .		2	2	8	12	1	1			2
70 . . .		1	3	13	17		3	2	1	6
80 . . .		1	3	6	10			2	1	3
90 . . .				11	11				1	1
100 . . .				9	9			2	1	3
No. of Cases	5	18	23	64	110	12	12	7	6	37
Median .					54					46

in the grade of child lost from year to year which would tend to account for differences between school and working children. The table shows a surprisingly equal distribution of losses from year to year in the two groups of boys. At fifteen and sixteen the losses of the school boys have medians of 43 and 42, showing a real preponderance of losses among the inferior school boys—as one would expect. At years seventeen and eighteen, however, the losses are so evenly distributed between the upper and lower parts of the scale that they center about the median—53 and 54. In other words, inferior school boys drop out of school in greater numbers than superior ones up to sixteen, but after that the losses are evenly distributed between the inferior and the superior ones.

In the case of the working boys, the losses are more consistently from the lower half of the scale than in the case of the school boys—a totally unexpected result. The losses of the working boys at fifteen are fairly evenly distributed, with a median at 51. At years sixteen, seventeen, and eighteen, the losses show medians of 43, 42, and 37. The differences in elimination accordingly would have the following tendencies to affect the outcome of comparisons between working and school boys.

At year fifteen the difference in favor of school boys shown in our tables is somewhat greater than it would have been had there been no elimination, since in the year fourteen to fifteen the working group lost more of its average or superior members (median 51) than the school group (median 43). From fifteen to sixteen the eliminations from the two groups were closely comparable in distribution, (median: school 42, working 43) and we can therefore conclude that the comparisons of year sixteen are not modified by this factor. Between sixteen and eighteen, those eliminated from the school group are fully average members (medians 53, 54), while those eliminated from the working group are below average (medians 42, 37). In these years, therefore, the difference between working and school boys, if there had been no elimination, would be somewhat greater than that shown in our scales. According to these figures, the effect of elimination was comparatively small. It tended to enhance the difference between working and school boys at fifteen, but to reduce it at seventeen and eighteen. Thus the difference in mental tests between working and school boys would appear somewhat more striking and more consistent from fourteen to eighteen years, if the effect of eliminations from the two series were removed.

In the case of the girls (Table 322) the losses of both groups are in most instances greater from the lower than from the upper part of the scale. The medians of the groups eliminated from the school girls were: at fifteen, 48; at sixteen, 46; at seventeen, 37; and at eighteen, 51. The effect for the first three years, accordingly, was to raise the level from year to year. The last year, eighteen, was not modified by elimination. In the case of the working girls the medians of the groups eliminated were: at fifteen, 28; at sixteen, 68; at seventeen, 44; and at eighteen, 47. The eliminations thus tended to produce slight shifts from year to year. At year fifteen the difference in favor of the school girls shown in our table is somewhat less than it would have been had there been no eliminations, since the group lost by the working girls (median 28) was very inferior to the group lost by the school girls (median 48). At year sixteen the reverse is the case. The difference in favor of the school girls is somewhat greater than it would have been had there been no eliminations, since working girls lost a group (median 68) superior to those lost by the school girls (median 46). At

TABLE 322 — DISTRIBUTIONS: OMISSIONS — MENTAL TESTS AVERAGE PERCENTILE RANK, X ON X SCALE, M ON M SCALE

Girls

15 Years

Percentiles	X					M				
	Grade V	Grade VI	Grade VII	Grade VIII	Total	Grade V	Grade VI	Grade VII	Grade VIII	Total
10 . . .	10	3			13	5	4	1		10
20 . . .	6	2			8	1	2	1	1	5
30 . . .	4	1	1	1	7	1	1	4	4	10
40 . . .	1	3	1		5	1	1	2		4
50 . . .	1	2	4		7		1			1
60 . . .		5	4		9	1	1		2	4
70 . . .	1		4		5			2	3	5
80 . . .	1	3	3	3	10					
90 . . .			5	2	7					
100 . . .	1		3	1	5		2	1	1	4
No. of Cases	25	19	25	7	76	9	12	11	11	43
Median .					48					28

16 Years

Percentiles	X					M				
	Grade V	Grade VI	Grade VII	Grade VIII	Total	Grade V	Grade VI	Grade VII	Grade VIII	Total
10 . . .	6	3			9	1	2	1		4
20 . . .	4	7	3		14					
30 . . .	4	4	3		11		1			1
40 . . .	1	5	5		11	1				1
50 . . .	2	8	4	1	15					
60 . . .	1	6	2	3	12	1			1	2
70 . . .		5	7		12		1		1	2
80 . . .		4	2	1	7		1	2	1	4
90 . . .		1	7		8		1		1	2
100 . . .		4		2	6			1	2	3
No. of Cases	18	47	33	7	105	3	6	4	6	19
Median .					46					68

seventeen and eighteen the medians of those eliminated from the two groups differ far less. At seventeen the group lost by working girls (median 44) was somewhat superior to those lost by school girls (median 37). Thus the seventeen-year difference of our table in favor of school girls is slightly greater than it would have been had there been no elimination. At eighteen the group lost by school girls (median 51) was slightly superior to that lost by working girls (median 47). Accordingly the eighteen-year difference in favor of school girls is somewhat less than it would have been without elimination. One is forced to conclude that the total trend of elimination in the two series was similar, and cannot, therefore, be regarded as responsible for important differences between the two.

TABLE 322—*Continued*

17 YEARS

PERCENTILES	X					M				
	Grade V	Grade VI	Grade VII	Grade VIII	Total	Grade V	Grade VI	Grade VII	Grade VIII	Total
10 . . .	9	5	2		16	6	3			9
20 . . .	1	3	2	1	7	3	2	2		7
30 . . .	3	3			6	1	2	1	1	5
40 . . .	2	1	5	1	9	3	4	1		8
50 . . .		6	1	1	8	2			2	4
60 . . .	1		2	1	4	1	2	1		4
70 . . .			2	2	4		1	2		3
80 . . .	1		2	2	5		3	1	2	6
90 . . .		1	2	2	5			2	5	7
100 . . .				3	3			4	2	6
No. of Cases	17	19	18	13	67	16	17	14	12	59
Median .					37					44

18 YEARS

PERCENTILES	X					M				
	Grade V	Grade VI	Grade VII	Grade VIII	Total	Grade V	Grade VI	Grade VII	Grade VIII	Total
10 . . .	1	5	1	1	8	4	3			7
20 . . .		5	3	5	13	4	3			7
30 . . .				4	4		2	2		4
40 . . .		1	2	5	8	1	5			6
50 . . .	1		1	6	8	2	2	4		8
60 . . .				16	16		2	2	2	6
70 . . .				6	6		2	1		3
80 . . .				3	3		3	2	3	8
90 . . .			1	8	9		1	3	2	6
100 . . .				6	6			1	1	2
No. of Cases	2	11	8	60	81	11	23	15	8	57
Median .					51					47

In the case of both boys and girls, in both school and working groups, the general trend was to lose a greater proportion of inferior than of superior individuals. However, the losses of the school group were larger in proportion to the total than the losses of the working group. Accordingly, the rank of the group remaining was increased more by the withdrawal of the inferior groups of school children than by the withdrawal of the inferior groups of working children. A part then of the difference between school and working groups must be attributed to the elimination of the inferior in greater numbers from the school than from the working group.

SUMMARY OF SECTION II

I. The superiority of school children at fourteen in every mental test can be due only to the fact that children who intend to remain in school are as a class superior mentally to those who are dropping out.

II. The fact that the difference is a progressive one from year to year up to seventeen years for both sexes is probably determined by several factors.

First, we have shown that while both groups lose their inferior members to a greater extent than their superior ones from year to year, the school group loses a larger proportion of cases than the working group. Elimination of the inferior thus becomes a factor in increasing the difference between the two groups.

Second, there is some evidence that mental growth continues to a greater age in the case of the school children than in the case of the working children (see Chapter VI). Even routine tests not closely related to school work, such as rote memory and substitution, keep on improving longer among school than among working children and show, on the whole, progressively greater differences between the two groups.

Third, the continued education of the school group gives them an advantage in certain types of tests, particularly those in which vocabulary and the use of language is a large factor. Though the tests are not primarily tests of educational progress, one cannot maintain that such tests as association by opposites or mutilated text are entirely unmodified by educational procedure. Continued acquisition of vocabulary in the study of high-school subjects and continued practice in dealing with the printed page doubtless modify the test result. The exceedingly large differences between the two groups found in this type of test at seventeen and eighteen suggest an added advantage due to training of the school group atthose levels.

SUMMARY OF CHAPTER V

I. School children are superior to working children both in physical tests and in mental tests at every age level from fourteen to eighteen years.

II. While the two groups approach one another in physical tests and measurements, so that the difference between them is less at eighteen than it was at fourteen, they recede from one another in mental tests, so that the difference is greater at eighteen years than it was at fourteen.

III. No single or simple explanation of these differences can be offered. In the first instance, at fourteen years, the superiority of the school group, both physical and mental, must be due to selection, since at that time all were school children and they were differentiated only by the intention of one group to go to work and of the other to remain in school. Their tendency during the years from fourteen to eighteen to approach one another in size and in most elements of physical skill is almost certainly related to the laws of physical growth, as they apply to superior and inferior individuals. It has already been shown that in size and in measures immediately related to it, such as vital capacity and strength, the inferior are slower of development than the superior and are therefore a year or two belated in their period of rapid adolescent approach to maturity (Baldwin [1]). This study demonstrates that the same law applies to all of the tests of physical skill used in this study. (See also Chapter VI.) Omissions from year to year have no tendency to cause the approach of the two physical series to one another. In view of the large part obviously played by mere laws of growth, it becomes highly speculative to draw any conclusions about the relative effect of school and industry on children. Though we started out with a desire to obtain information on this very point, we are forced to conclude that so far as physical development is concerned the study offers no certain evidence on the point.

Mental tests differ from physical tests in that the tendency is for the two groups to differ more and more from year to year. The series gives us far less information about the laws of yearly growth in mental than in physical tests, but there is some evidence of the same tendency for a belated period of adolescent mental growth among the inferior (see Chapter VI). It is not marked enough, however, to produce the phenomenon of a progressive approach of school and working children. Other factors overbalance it. Elimination of the inferior in larger numbers from the school than from the working group up to sixteen years; a tendency for mental growth of the superior to continue after the period of rapid adolescent change; and the advantage in some tests given to the school group by their continued education, all contribute to the result.

IV. In discussing the behavior of the mental and physical series, we commented frequently on the fact that while the physical series—particularly in the case of the boys—showed differences between school and working children which were greater in the superior than in the inferior part of the scale, the reverse was true in the mental series. The retarded period of rapid adolescent change in physical growth and capacities among working children accounted in part for this difference in the earlier years. However, the same tendency is evident in most of the individual tests of the physical series at eighteen years after the working children also have passed the spurt of adolescent growth. With less uniformity the tendency shows in the girls' records. In average percentile rank in physical tests the differences between working and school children at eighteen are greater in the lower than in the upper part of the scale, but this is due largely to the reversal of values in the steadiness test. A discussion of the probable meaning of this difference in the behavior of the mental and physical series will be taken up in Chapter IX in discussing the relation of mental and physical ratings to one another. We believe it to be due in part to the nature of the tests used and in part to the forces of selection at work in differentiating school from working children.

Very few experimental studies comparing groups of working children with groups of school children have been made. Two have emanated from the University of Pennsylvania: one by Lodor on the continuation girl (2), and one by Leaming on tests and norms for vocational guidance at the fifteen year performance level (3). Both of these studies agree with ours in finding school children very superior in test level to working children. Lodor finds an exception in the case of the Witmer cylinder test. In our series none of the tests was of the same type as the Witmer cylinders. The construction puzzles are the ones that are most like it, but they demand more thinking and planning than the Witmer cylinders. They showed a superiority of the school group.

References

(1) Baldwin, Bird T.—*The Physical Growth of Children from Birth to Maturity.* Iowa City: University of Iowa, 1922.

(2) Lodor, E.—"The Continuation Girl," *Psychological Clinic*, 1920, *Vol. 13*, 202–210.

(3) Leaming, R. E.—"Tests and Norms for Vocational Guidance at the Fifteen-year-old Performance Level," *Psychological Clinic*, 1922, *Vol. 14*, 193–217.

APPENDIX TO CHAPTER V

DISTRIBUTION TABLES UPON WHICH THE PERCENTILE TABLES OF SECTION I, CHAPTER V, ARE BASED

TABLE 323 — DISTRIBUTIONS: HEIGHT

Boys

CENTIMETERS	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
135.6−	3					4	1			
135.6	11	2				12	3	1		
139.5										
139.6	21	5	1			34	8	2		
143.6	45	9	5			79	14	6		
147.6	77	21	4			87	50	7	2	
151.6	80	26	7			86	64	27	4	2
155.6	78	51	18	7	1	53	80	52	11	5
159.6	53	49	40	13	2	43	76	71	40	28
163.6	32	56	65	35	8	17	46	75	75	51
167.6	15	35	52	40	17	8	37	62	77	79
171.6	12	25	47	41	11		10	31	63	69
175.6		12	30	24	10		2	9	28	42
179.6		12	10	10	6			1	7	12
183.6			6	4	4			1	3	6
187.6				1						
No. of Cases . .	427	291	285	175	59	423	391	345	310	294

TABLE 324 — DISTRIBUTIONS: HEIGHT

Girls

CENTIMETERS	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
135.6−										
135.6	1									
139.6	1	3				3	3			
143.6	6	7	5	3	2	10	6	4	3	1
147.6	24	21	12	4	2	28	33	21	8	4
151.6	70	61	25	14	4	55	57	47	36	23
155.6	76	67	67	43	11	79	87	70	59	39
159.6	82	47	66	44	22	81	53	79	61	46
163.6	53	38	40	32	12	49	33	43	48	34
167.6	15	4	13	13	6	19	11	20	20	19
171.6	3	2	6	6	1	6	2	4	3	5
175.6	1	1	2	1	1				1	
179.6										
183.6										
No. of Cases . .	332	251	236	160	61	330	285	288	239	171

TABLE 325

DISTRIBUTIONS: WEIGHT

Boys

KILOGRAMS	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
30–	5					8				
30–33.9	22	7	1			42	9	4		
34	60	11	4			77	29	9		
38	79	22	7			121	59	17	4	
42	93	43	16	4		81	74	39	11	8
46	73	39	39	10	1	48	83	53	26	12
50	36	60	39	21	3	25	62	73	48	30
54	36	74	88	37	12	17	53	94	82	65
58	17	20	59	42	13	3	19	43	72	73
62				25	9				48	54
66	2	14	21	22	12	1	3	13	14	37
70	3		6	5	1			1	3	12
74				4	4					2
78			1	2						
82+			3	3	1					
No. of Cases	426	290	284	175	56	423	391	346	308	293

TABLE 326

DISTRIBUTIONS: WEIGHT

Girls

KILOGRAMS	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
30–	1					1				
30–33.9	4					15				
34	33	7				31	12	3		
38	52	22	17	3	3	61	24	15	6	4
42	75	41	24	10	6	77	48	36	19	13
46	86	66	51	39	8	66	74	67	44	37
50	41	58	57	42	14	45	55	64	56	38
54	25	35	59	29	12	20	50	68	47	45
58	9	14	15	17	3	6	13	25	40	21
62				5					14	5
66	3	9	9	10	5	8	3	4	6	4
70	3		2	1	1		4	7	4	5
74				1			2		2	1
78			2						1	1
82+			2	3	1			2		1
No. of Cases	332	252	238	160	53	330	285	291	239	175

TABLE 327

DISTRIBUTIONS: VITAL CAPACITY

Boys

Cubic Centimeters	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
1200–						3				
1201–1400 . .	3					8				
1401	4	1				12	6		1	
1601	17	2	2	1		23	5	5		
1801	28	5	2			53	23	5	1	
2001	71	27	3			82	44	10	3	1
2201	79	31	7			82	67	27	2	5
2401	64	25	18	2		49	48	33	14	3
2601	54	39	19	6	2	42	53	53	21	7
2801	31	35	28	5	2	29	59	45	38	26
3001	24	37	31	9	3	12	34	36	28	41
3201	24	29	42	9	4	4	23	47	41	27
3401	8	19	36	8	2	8	12	25	38	34
3601	12	14	26	14	7		3	17	39	31
3801		14	18	7	6		2	12	26	21
4001		7	14	3	4		2	12	21	30
4201			10	9	7			3	13	15
4401			3	6	4			2	5	12
4601			5	5	2				1	4
4801			3		2				1	3
5001					2					3
No. of Cases . .	419	285	267	84	47	407	386	332	293	263

TABLE 328

DISTRIBUTIONS: VITAL CAPACITY

Girls

CUBIC CENTIMETERS	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
1001–1200 . .	2					10				
1201	3					17				
1401	11	2				23	8			
1601	20	9	6	1	4	30	19	19	10	7
1801	68	24	12	6	3	72	50	26	26	11
2001	73	54	28	11	1	66	70	55	23	24
2201	68	48	29	25	7	53	44	62	40	25
2401	42	44	42	20	7	25	38	50	49	32
2601	21	40	37	18	5	15	30	28	32	26
2801	7	13	16	15	7	7	8	19	17	16
3001	3	9	9	10	4	1	10	13	15	4
3201	4	2	7	5	1			1	3	2
3401		1	1	2	1			3	2	
3601			3	2	3	1				
3801				1					1	1
No. of Cases . .	322	246	190	116	43	320	277	276	218	148

TABLE 329

DISTRIBUTIONS: STRENGTH OF THE HAND

Boys

Right Hand

Kilograms	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10.6–12.5 . .	1					2				
12.6	1					3				
14.6	2					15	2			
16.6	11	2				20	1	1		
18.6	20	2				41	10	4		
20.6	24	4				51	17	5		
22.6	58	12	4			58	31	14		
24.6	58	18	3			80	38	12	2	
26.6	59	21	8	2		55	47	22	4	
28.6	51	34	12	1		35	49	30	7	3
30.6	39	20	15	2		27	23	37	15	5
32.6	32	22	15	4		13	15	33	13	8
34.6	21	21	23	6		5	30	45	17	10
36.6	12	13	26	7		5	14	27	16	8
38.6	11	21	28	12	1	2	22	22	24	19
40.6	5	21	27	17	8	2	6	23	35	28
42.6	8	13	19	15	3	2	4	14	38	25
44.6	9	49	30	19	10		5	17	20	43
46.6			15	13	5			8	28	31
48.6			13	14	4			20	19	24
50.6			11	19	6				24	28
52.6			9	13	8				9	11
54.6			8	10	6				11	7
56.6			9	9	4					5
58.6+				10	6					8
No. of Cases . .	422	273	275	173	61	416	314	334	282	263

TABLE 329—*Continued*

Left Hand

Kilograms	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10.6–12.5 . .	1					1				
12.6	2					7	1			
14.6	7	1				15	3	1		
16.6	16	2				18	1	2		
18.6	31	2				49	16	7		
20.6	31	8	3			50	24	7		
22.6	67	17	5	2		67	36	20	1	
24.6	63	29	8	1		76	40	16	7	2
26.6	61	21	9			47	37	28	3	2
28.6	40	30	19	3		44	44	34	16	7
30.6	39	28	19	1	1	18	24	40	26	7
32.6	15	24	20	10	1	11	22	35	9	12
34.6	14	27	43	16	3	7	27	38	16	18
36.6	15	21	19	11	5	4	17	34	34	16
38.6	6	17	26	18	4	2	13	18	33	29
40.6	13	18	24	17	2	2	11	18	29	25
42.6		6	19	19	7			13	35	29
44.6		23	19	17	9			7	18	42
46.6			18	16	3			15	18	32
48.6			5	18	6				13	19
50.6			21	8	7				12	15
52.6				16	5				11	6
54.6					7					10
56.6										
No. of Cases . .	421	274	277	173	60	418	316	333	281	271

TABLE 330 — DISTRIBUTIONS: STRENGTH OF THE HAND

Girls

Right Hand

Kilograms	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10.6–12.5	1					3				
12.6						11				
14.6	7	2				21	4	1		
16.6	8	2	1			17	6	7		
18.6	35	8	2			45	12	10	4	1
20.6	41	9	2	1	2	65	18	30	10	2
22.6	50	22	21	7	1	31	37	33	9	14
24.6	65	43	24	12	5	56	40	44	24	17
26.6	44	41	35	24	8	30	37	53	35	31
28.6	45	45	50	25	13	30	30	42	57	26
30.6	19	33	41	27	10	15	20	29	40	22
32.6	9	19	17	19	9	2	5	11	16	10
34.6	2	9	12	12	10	1	1	7	8	6
36.6		6	8	11	5	2		3	3	3
38.6		5	4	6	5			4	5	2
40.6		1	1	3					2	3
42.6				2	1	1		1	3	
44.6				1						
No. of Cases	326	245	218	150	69	330	210	275	216	137

Left Hand

Kilograms	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10.6–12.5	2					3				
12.6	1					8	1	1		
14.6	14	5				23	5	3	3	2
16.6	20	5	2		2	24	12	6	3	4
18.6	42	12	6	6	2	47	21	21	5	1
20.6	52	17	15	8	5	68	34	39	15	8
22.6	56	49	36	16	2	43	32	55	23	17
24.6	56	43	40	20	9	51	36	43	36	26
26.6	48	42	33	21	8	22	31	35	38	22
28.6	19	40	31	35	18	25	26	37	36	23
30.6	14	12	34	21	10	10	7	22	29	17
32.6	2	12	12	12	6	3	4	10	15	7
34.6	1	7	6	5	4	1	1	5	6	4
36.6	1	1	1	4		1		1	2	2
38.6				2	3			1	4	1
40.6			1						2	2
No. of Cases	328	245	217	150	69	329	210	279	217	136

TABLE 331 — DISTRIBUTIONS: STEADINESS OF THE HAND

Boys

RIGHT HAND

HOLE	No. of Contacts	X					M				
		14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
I	12–6	3					2				
	5–0										
II	12–6	10					26	12	1		
	5–0	2					13	8	1		
III	12–6	55		3	3	1	85	43	24	2	
	5–0	6	4	1	1		36	18	7		
IV	12–6	119	48	22	21	3	131	119	53	20	6
	5–0	23	8	7	4	4	30	25	14	3	2
V	12–6	89	58	36	18	10	52	79	59	33	32
	5–0	11	6	7	7	2	5	7	6	2	3
VI	12–6	53	66	72	51	8	24	39	76	65	49
	5–0	6	3	7	8	2		2	9	3	2
VII	12–6	22	43	53	28	16	2	11	46	71	71
	5–0	2	2		4	2			4	5	5
VIII	12–6	13	29	36	20	5			25	58	68
	5–0	1		9	3	1			1	5	5
IX	12–6	10	22	12	4	1			14	22	30
	5–0			13	2					1	6
No. of Cases		425	289	278	174	55	406	363	340	290	279

LEFT HAND

HOLE	No. of Contacts	X					M				
		14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
I	12–6	8					11	1			
	5–0										
II	12–6	43	4	3	4		48	26	11	1	
	5–0	5	2				23	15	3		
III	12–6	103	38	10	12		138	85	41	10	
	5–0	26	6	5	2	3	40	32	9	3	2
IV	12–6	124	82	61	37	10	99	123	103	55	35
	5–0	23	14	15	5	7	15	18	9	6	3
V	12–6	45	52	54	33	13	20	43	67	57	55
	5–0	3		4	4	2	3	1	2	2	1
VI	12–6	25	42	63	38	10	4	16	48	71	69
	5–0	2	2	7	4	1	1		4	6	2
VII	12–6	9	23	18	23	7	1	4	25	42	62
	5–0			5	3	1			1	3	2
VIII	12–6	5	9	12	4	1			13	24	33
	5–0	1	2	1	1						1
IX	12–5	4	12	16	4				2	10	13
	5–0			4							1
No. of Cases		426	288	278	174	55	403	364	338	290	279

TABLE 332 — DISTRIBUTIONS: STEADINESS OF THE HAND

Girls

RIGHT HAND

HOLE	No. of Contacts	X					M				
		14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
I	12–6										
	5–0										
II	12–6	3		2			12	3		2	
	5–0	2	1	1	1		4	1			
III	12–6	29	6	7	4	1	48	12	4	1	2
	5–0	5	6	2	2		28	6	3		1
IV	12–6	78	22	20	17	4	102	81	32	14	5
	5–0	15	7	12	6	3	24	19	13	4	5
V	12–6	75	41	47	26	8	58	64	66	28	11
	5–0	6	8	3	5	1	5	7	5	1	5
VI	12–6	69	48	50	33	14	29	48	58	46	26
	5–0	9		6	6	7		4	6	5	2
VII	12–6	26	47	26	20	9	8	22	49	45	30
	5–0	1	2		3	2	2		2	2	6
VIII	12–6	4	43	25	17	2	2	4	25	30	26
	5–0	1		1	3	1			2	3	4
IX	12–6	6	21	18	5	3			20	18	14
	5–0			5	3				1	5	5
No. of Cases		329	252	225	151	55	322	271	286	204	142

LEFT HAND

HOLE	No. of Contacts	X					M				
		14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
I	12–6	3		2			8	2	1		
	5–0										
II	12–6	15	6	10	10		25	10	2	3	
	5–0	7		3			14	3	2		
III	12–6	63	22	14	10	4	83	41	18	5	7
	5–0	20	6	7	5	3	37	18	7	2	1
IV	12–6	109	53	44	42	18	93	93	87	33	21
	5–0	11	13	12	7	3	13	18	13	9	3
V	12–6	53	60	47	28	10	29	53	47	45	29
	5–0	6	5	2	4		3	1	1	1	2
VI	12–6	28	34	37	16	5	13	18	54	43	25
	5–0	2	6	1	5	2	1	3	6	3	
VII	12–6	4	15	19	13	6	1	10	32	25	22
	5–0		1	2		1			1	2	1
VIII	12–6	3	17	10	8			1	10	18	18
	5–0			2	1				2	2	
IX	12–6	1	11	8	1	2			2	12	12
	5–0			5	1					2	
No. of Cases		325	249	225	151	54	320	271	285	205	141

TABLE 333 — DISTRIBUTIONS: TAPS IN 30-SECOND PERIOD

Boys

RIGHT HAND

No. of Taps	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
100–										
101–110										
111						1	1	1		
121	4		1			3	4	1		
131	1			3		16	6	4		
141	4	2	4	3		41	26	13	5	3
151	34	7	8	4		60	30	18	16	10
161	68	43	19	11	2	65	67	51	37	31
171	85	46	40	23	8	84	81	65	57	46
181	83	49	62	24	8	62	85	62	60	60
191	61	59	39	29	13	25	35	61	56	57
201	42	32	43	35	8	8	28	29	27	32
211	22	25	21	14	10	5	9	16	16	22
221	14	30	13	26	2	3	6	12	26	13
231	8		10		1		4	5		5
241			4		1		2	2		5
251			8					3		
261					3					
271										
281										
291										3
301										
No. of Cases	426	293	272	172	56	373	384	343	300	287

LEFT HAND

No. of Taps	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
100–						5				
101–110	3			1		14	1	2	1	1
111	17	6	4	3	1	26	19	8	2	4
121	43	18	14	11	2	53	47	19	23	10
131	66	36	26	12	4	87	63	51	29	25
141	89	57	40	16	4	67	87	75	62	54
151	93	60	52	35	12	62	78	66	54	60
161	49	47	56	29	11	34	58	53	54	57
171	31	30	28	31	7	15	14	32	31	32
181	12	21	17	14	8	3	9	18	20	20
191	15	11	17	8	4	1	4	9	13	16
201	5	6	8	4	2	1	1	4	6	4
211	2		4	3	1		1	3	5	3
221	1		5	4						
231				1						
No. of Cases	426	292	271	172	56	368	382	340	300	286

TABLE 334

DISTRIBUTIONS: TAPS IN 60-SECOND PERIOD

Boys

RIGHT HAND

No. of Taps	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
200–										
201–220						1	4	1		
221	2									
241	4			3		11	6	2		
261	6	3	4	1		37	14	10	3	2
281	26	8	10	4	2	51	41	16	12	8
301	78	34	27	8	2	80	72	52	39	27
321	94	51	44	19	3	85	77	66	57	52
341	86	58	55	32	7	61	83	71	64	65
361	55	62	47	28	18	32	51	61	56	53
381	45	33	37	28	5	5	21	31	31	34
401	19	21	23	20	7	4	9	19	19	23
421	5	12	8	9	6	2	3	4	10	8
441	3	11	4	9	2	1	1	9	8	9
461	3		8	3	1		2		3	4
481			3	8	3					2
491+										
No. of Cases	426	293	270	172	56	370	384	342	302	287

LEFT HAND

No. of Taps	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
200–	3					11			1	
201–220	7	1	2	2		17	12	4		
221	46	15	6	5		61	39	15	9	6
241	64	33	23	10	4	70	64	50	32	23
261	92	58	37	20	5	83	92	71	54	44
281	107	59	49	27	12	65	86	70	65	70
301	45	58	59	29	10	36	56	63	50	55
321	29	35	37	38	10	14	18	37	45	48
341	17	19	26	18	6	7	9	14	20	20
361	10	7	13	12	4	2	4	11	15	12
381	5	8	8	3	4	1	1	4	5	5
401			3	3	1		1	1	4	3
421	1		4	4						1
441			4							
461				1						
481+										
No. of Cases	426	293	271	172	56	367	382	340	300	287

TABLE 335

DISTRIBUTIONS: TAPS IN 30-SECOND PERIOD

Girls

RIGHT HAND

No. of Taps	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
100–										
101–110 . . .					1	1				
111						1	3			1
121					1	2	2	1	2	
131	2	1	2			8	6	3		
141	10	3	3	4		26	13	4	3	1
151	34	14	14	6		52	37	21	10	14
161	48	39	33	15	4	80	67	62	47	24
171	86	58	55	26	10	66	81	77	59	45
181	63	57	48	37	24	37	31	50	54	48
191	42	35	39	34	10	17	24	45	31	22
201	34	23	27	23	7	3	13	11	13	8
211	8	13	5	9	6	2	3	9	8	5
221	2	7	2	4	3	1		4	7	4
231			2		1		1	1		2
241			3		1			2		
251+			2		1					
No. of Cases . .	329	250	235	158	69	296	281	290	234	174

LEFT HAND

No. of Taps	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
100–					1	8				
101–110. . . .	6	1	1	1		5	6	3	2	
111	10	12	6	1	1	24	18	11	5	1
121	36	16	12	6	4	49	32	25	13	13
131	58	35	37	22	5	65	63	56	34	23
141	80	52	42	31	9	55	64	62	60	38
151	63	61	54	34	18	48	50	65	52	44
161	47	38	44	28	13	20	25	39	30	30
171	16	22	22	19	10	14	17	16	23	10
181	8	9	7	9	5	5	3	3	8	6
191	2	2	2	4	1	2	3	5	2	6
201	2	1	4	3	1		1	3	1	2
211			2		1			1	1	
221			1							
231										
241										
251+										
No. of Cases . .	328	249	234	158	69	295	282	289	231	173

TABLE 336

DISTRIBUTIONS: TAPS IN 60-SECOND PERIOD

Girls

RIGHT HAND

No. of Taps	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
200–										
201–220 . . .						2				
221					2	2	6	1	1	1
241	2					6	4	2	1	
261	4	5	3	2		19	10	2	2	
281	37	8	10	5		53	31	17	5	7
301	63	44	19	15	3	87	71	51	39	21
321	76	52	63	24	16	59	79	96	65	43
341	69	60	55	35	18	44	43	60	58	58
361	43	41	46	36	11	19	24	36	39	25
381	26	23	26	26	9	4	12	15	12	8
401	7	12	6	8	4			5	4	4
421	1	3	2	4	3	1	1	3	4	4
441		2	1	2	1			1	3	3
461			3		1				1	
481+			1	1	1					
No. of Cases . .	328	250	235	158	69	296	281	289	234	174

LEFT HAND

No. of Taps	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
200–	4	1			2	8	3		1	
201–220 . . .	11	5	3	1		18	11	6	3	
221	27	11	9	3	2	37	26	21	10	5
241	62	35	31	13	6	75	54	52	25	23
261	81	55	38	30	6	68	74	58	49	30
281	73	60	54	38	16	46	56	79	66	47
301	44	46	56	35	18	26	38	43	39	40
321	14	25	25	20	13	10	11	18	22	12
341	11	9	9	12	2	5	5	7	11	10
361	1	2	3	3	2	4	2	1	3	5
381			3	2	1			3		1
401			2	1	1			1	2	
421										
441			1							
461										
481+										
No. of Cases . .	328	249	234	158	69	297	280	289	231	173

TABLE 337

DISTRIBUTIONS: CARD-SORTING — TIME

Boys

Seconds	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
30.0–	2	4	10	4	7	2	1	6	5	7
30.1–35 . . .	19	35	52	42	17	7	19	31	36	54
35.1	76	98	102	69	25	31	53	92	93	94
40.1	143	84	83	38	10	85	110	92	89	78
45.1	95	43	22	14	1	103	100	67	49	32
50.1	56	21	13	4		97	65	31	20	17
55.1	21	3	1		1	59	23	10	2	5
60.1	8	4	1		1	25	10	7	3	2
65.1	3					14	4	1	1	2
70.1	2					9	2	1	1	1
75.1+										
No. of Cases . .	425	292	284	171	62	432	387	338	299	292

TABLE 338

DISTRIBUTIONS: CARD-SORTING — INDEX

Boys

Seconds	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
30.0–	2	4	6	3	7	2	1	4	5	7
30.1–35 . . .	14	27	59	39	14	4	15	46	30	45
35.1–	66	93	83	65	26	19	44	61	88	89
40.1	116	72	90	44	9	81	99	103	78	78
45.1	96	53	22	14	4	81	96	57	59	36
50.1	77	30	21	2		95	62	40	22	17
55.1	31	7	2	3	1	53	40	10	6	6
60.1	13	4	1			37	10	17	3	5
65.1	7	1		1	1	17	2		4	2
70.1	2					11	3			3
75.1+.	1					3				
No. of Cases . .	425	291	284	171	62	403	372	338	295	288

TABLE 339

DISTRIBUTIONS: CARD-SORTING — TIME

Girls

Seconds	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
30.0–	3	6	13	11	9		3	9	7	13
30.1–35 . . .	37	68	72	57	32	12	36	58	73	53
35.1	98	77	91	59	14	64	94	121	87	70
40.1	109	63	44	26	12	108	82	73	46	36
45.1	49	28	10	2	1	80	45	22	16	11
50.1	25	8	2	3	1	38	11	4	5	3
55.1	6	1	1			14	5		1	1
60.1	2	1				4	2		1	
65.1	1		2			3		1		
70.1	3	1				3	1			
75.1+.										
No. of Cases . .	333	253	235	158	69	326	279	288	236	187

TABLE 340

DISTRIBUTIONS: CARD-SORTING — INDEX

Girls

Seconds	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
30.0–	3	8	8	9	8		3	8	6	12
30.1–35 . . .	32	54	81	51	22	9	35	58	65	52
35.1	89	77	71	63	19	48	89	96	84	61
40.1	109	63	59	27	11	102	82	91	45	34
45.1	54	34	8	5	3	82	37	26	24	12
50.1	28	11	5	3	1	49	20	8	8	5
55.1	8	3	1			15	9		3	1
60.1	2	2	2			5	2	1		1
65.1	3					5	1		1	
70.1		1				2	1			
75.1+.	3					2				
No. of Cases . .	331	253	235	158	64	319	279	288	236	178

TABLE 341

DISTRIBUTIONS: PHYSICAL TESTS — AVERAGE PERCENTILE RANK

Boys

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10–	1					2		2		
11				1		9	5	6	3	2
16	1	1	2		1	18	15	8	7	3
21	6	6	5	2		24	30	25	16	8
26	11	2	4	3		44	26	23	15	17
31	16	8	12	4		28	42	29	26	10
36	30	17	17	10	2	61	39	38	35	21
41	29	23	14	14	6	46	48	54	38	39
46	40	21	21	16	1	56	52	38	40	38
51	48	26	20	16	6	38	50	31	35	39
56	40	35	35	24	9	41	31	28	33	24
61	46	29	42	17	10	34	22	16	18	32
66	39	22	31	20	7	15	10	15	16	29
71	48	31	29	11	8	10	9	15	13	13
76	40	23	21	21	6	5	5	9	11	12
81	17	27	19	10	3	6	5	3	3	5
86	10	13	7	2	2	1	1	1	2	2
91	7	7	3	1				4		1
96	1	2	1	1						
No. of Cases . .	430	293	283	173	61	438	390	345	311	295

TABLE 342

DISTRIBUTIONS: PHYSICAL TESTS — AVERAGE PERCENTILE RANK

Girls

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10–	2								1	1
11	5		1			2	4	2	1	1
16	12	2	2	3	1	3	6	5	5	2
21	12	2	5	2	1	6	16	19	9	4
26	22	8	7	2	2	9	23	18	15	8
31	45	11	7	6		8	34	28	15	12
36	36	16	7	6	3	21	25	28	21	12
41	39	16	17	9	2	12	39	30	22	18
46	37	18	32	19	2	36	37	32	38	23
51	42	32	17	18	22	37	22	36	20	24
56	26	31	29	21	7	45	28	31	23	13
61	22	28	26	20	4	34	19	24	20	17
66	14	28	36	17	9	37	11	14	17	21
71	10	22	19	13	10	35	10	11	11	7
76	3	22	11	13	3	21	4	7	15	7
81	4	7	10	6	1	11	2	7	3	5
86	2	6	3	2	3	9		1	1	
91		4	1	2		2				
96										
No. of Cases . .	333	253	230	159	70	328	280	293	237	175

DISTRIBUTION TABLES UPON WHICH THE PERCENTILE TABLES OF SECTION II, CHAPTER V, ARE BASED

TABLE 343 — DISTRIBUTIONS: CANCELLATION — INDEX

Boys

Seconds	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
80.1		6		1	1				1	8
100.1	3	30	5	2	23	2	7	2	7	39
120.1	12	72	34	14	19	7	38	15	16	71
140.1	26	64	56	31	12	27	65	48	50	70
160.1	50	51	63	48	4	48	74	71	57	46
180.1	64	34	51	35	5	61	62	67	54	33
200.1	62	23	33	12	1	63	55	48	35	14
220.1	57	4	18	9	1	47	47	33	32	7
240.1	41	3	10	8		38	19	21	14	1
260.1	34	1	4	8		31	5	13	20	1
280.1	26		5	2		19	7	5	5	1
300.1	11		1	3		21	2	6	8	
320.1	8		3			10		7		
340.1	9	4				13	3	5		
360.1	7					7				
380.1	4					8				
400.1	5					3				
420.1	7					12				
420+										
No. of Cases . .	426	292	283	173	66	417	384	346	299	291

TABLE 344 — DISTRIBUTIONS: CANCELLATION — ACCURACY

Boys

Percents	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
100−95.6. . .	119	181	142	106	56	68	180	97	133	206
95.5	89	65	61	33	6	41	86	89	74	58
90.5	84	36	45	22	4	85	64	80	55	16
85.5	50	4	14	7	1	35	29	32	17	6
80.5	40	3	18	2		49	14	20	9	2
75.5	14	3	5	4		41	2	13	4	2
70.5	13	1	2	1		22	4	9	5	
65.5	10					21	3	1	3	
60.5	7					14	3	4	2	1
55.5	2					12	3		1	
50.5			1			12		1		
45.5	1					10				
40.5						3				
35.5						3				
30.5						2				
25.5−						2				
No. of Cases . .	429	293	288	175	67	420	388	346	303	291

TABLE 345 — DISTRIBUTIONS: CANCELLATION — INDEX

Girls

Seconds	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
80.1–		9		3	18		10	3	3	35
100.1	7	48	15	11	20	5	26	16	24	50
120.1	19	67	40	24	12	19	68	47	43	44
140.1	36	60	52	34	16	45	65	60	58	40
160.1	35	38	48	34	5	54	46	52	42	19
180.1	50	20	33	31	3	50	31	38	33	6
200.1	41	8	22	10	2	37	13	34	16	2
220.1	37	2	10	7	1	38	7	20	5	2
240.1	32		9	3		17	6	9	8	1
260.1	25	1	4	1		12	2	7	3	
280.1	14			2		10	1		2	
300.1	11	1				14			2	
320.1	5		2			7		1		
340.1	4					5	3	2		
360.1	3					1				
380.1	2					2				
400.1–	3					1				
420+	3					5				
No. of Cases . .	327	254	235	160	77	322	278	289	239	199

TABLE 346 — DISTRIBUTIONS: CANCELLATION — ACCURACY

Girls

Percents	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
100–95.6 . . .	82	144	119	106	61	31	161	93	75	149
95.5	69	62	45	29	12	48	45	65	65	32
90.5	67	34	39	15	2	46	41	64	50	9
85.5	28	6	11	10	2	48	12	25	14	3
80.5	40	5	11	2		47	7	18	19	4
75.5	16	3	5			26	3	14	9	2
70.5	7		3	1		14	3	12	2	
65.5	6					21	2	1	4	
60.5	5		1	1		16	3		2	
55.5	2	1	1			8	2			
50.5	4					10			2	
45.5	1		1			6		2		
40.5						4				
35.5						2				
30.5	1									
25.5–										
No. of Cases . .	328	255	236	164	77	327	279	294	242	199

TABLE 347

DISTRIBUTIONS: SUBSTITUTION — INDEX

Boys

PRACTICE PAGE 1

SECONDS	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
80−			2							
80.1		18	42	32	20	1	4	8	6	9
100.1	45	81	100	61	28	9	25	59	62	75
120.1	87	105	66	51	12	51	77	113	96	88
140.1	109	49	48	20	3	69	98	95	77	75
160.1	94	26	18	9	3	63	87	36	34	33
180.1	48	12	7	2		60	47	23	21	10
200.1	21	3	1			47	20	7	11	6
220.1	12	1				16	11	5	1	5
240.1	4		1			12	7	1	1	
260.1	1					5	4			1
280.1	2					1	2			2
300.1+						6				
No. of Cases . .	423	295	285	175	66	340	382	347	309	304

PRACTICE PAGE 2

SECONDS	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
60−		1	2							
60.1	16	44	42	30	21	6	13	19	24	21
80.1	76	108	111	72	30	29	59	90	67	81
100.1	124	76	64	44	13	66	101	91	104	95
120.1	106	48	42	21	1	110	94	83	67	58
140.1	63	12	18	6	1	56	66	42	27	29
160.1	23	4	5	2	1	39	23	12	13	10
180.1	13	2	2			26	12	7	4	8
200.1	4					8	7	2	1	1
220.1			1			7	6	1		
240.1										
260.1										
280.1										
300+										
No. of Cases . .	425	295	287	175	67	347	381	347	307	303

TABLE 347—*Continued*

Seconds	X					M				
	Practice Page 3		Memory Page 3			Practice Page 3		Memory Page 3		
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
60−	1		24	11	9				5	5
60.1	53	89	75	42	28	24	38	65	61	65
80.1	120	106	73	45	9	70	96	73	81	68
100.1	134	67	39	21	10	95	107	68	55	45
120.1	68	24	20	16	4	71	69	19	28	36
140.1	31	3	15	15	2	38	41	28	17	23
160.1	16	2	11	4	1	26	13	13	13	9
180.1	4	2	6	4	2	8	9	13	10	16
200.1		1	6	4	1	4	10	13	4	8
220.1			3	2		3		8	7	7
240.1			3	1				3	7	1
260.1			3	1				1	1	4
280.1			2	7				5	1	4
300+			4		1			25	17	12
No. of Cases	427	294	284	173	67	339	383	334	307	303

MEMORY PAGE 4

Seconds	X		M	
	14 yrs.	15 yrs.	14 yrs.	15 yrs.
60−	6	16	2	5
60.1	76	97	42	68
80.1	126	72	84	97
100.1	73	47	72	77
120.1	37	12	42	30
140.1	32	21	26	23
160.1	14	8	14	15
180.1	15	6	11	5
200.1	11	3	8	10
220.1	4	2	7	11
240.1	5	8	8	8
260.1	7		5	3
280.1+	17		16	26
No. of Cases	423	292	337	378

TABLE 348

DISTRIBUTIONS: SUBSTITUTION—INDEX

Boys

Sum of Practice Pages

X								M							
Pages 1, 2, 3			Pages 1, 2					Pages 1, 2, 3			Pages 1, 2				
Seconds	14 yrs.	15 yrs.	Seconds	16 yrs.	Seconds	17 yrs.	18 yrs.	Seconds	14 yrs.	15 yrs.	Seconds	16 yrs.	Seconds	17 yrs.	18 yrs.
150—			150	21	150—	5	5	150—			150	5	150—		2
151			165	18	151	15	11	151			165	4	151		6
176			180	45	176	39	20	176			180	5	176	33	32
201			195	35	201	41	18	201			195	32	201	52	67
226		24	210	40	226	37	6	226		5	210	47	226	69	68
251	17	37	225	34	251	22	2	251	8	9	225	43	251	57	42
276	33	46	240	23	276	5	3	276	9	14	240	32	276	37	41
301	28	48	255	19	301	5		301	25	35	255	40	301	26	22
325	58	40	270	15	325	2	1	325	25	38	270	43	325	15	10
351	60	40	285	11	351	1		351	33	59	285	24	351	8	4
376	53	19	300	6	376			376	40	40	300	26	376	7	4
401	49	19	315	12	401			401	42	44	315	15	401	1	6
426	44	10	330	1	426			426	28	35	330	10	426		
451	18	3	345	2	451			451	39	31	345	6	451		
476	22	3	360	2	476			476	32	22	360	4	476		
501	13		375	1	501			501	11	14	375	2	501		
526	7		390		526			526	19	13	390	2	526		
551	9		405	1	551			551	9	2	405	6	551		
576	4	1			576			576	11	4			576		
600+	3	1			600			600	18	12			600		
No. of Cases	418	293		286		172	66	No. of Cases	349	377		346		305	304

TABLE 349

DISTRIBUTIONS: SUBSTITUTION—ACCURACY

Boys

MEMORY PAGE

PERCENTS	X					M				
	PAGE 4		PAGE 3			PAGE 4		PAGE 3		
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
100	144	123	103	61	35	130	158	108	114	112
98	74	42	44	29	10	52	60	52	46	43
96	54	31	27	11	3	40	48	25	29	16
94			18	12	1			25	19	16
92	23	22	8	4	2	24	25	10	9	14
90			9	8	2			16	8	7
88	23	21	8	3	1	23	17	7	10	16
86			7	5	2			7	12	7
84	21	12	7	4	1	15	11	12	8	7
82			10	6				8	5	6
80	13	14	3	3	2	12	11	9	9	11
78			2	1	1			9	5	8
76	12	7	8	4	3	12	6	4	2	7
74			5	3				3	2	2
72	15	5	1	5		8	8	6	4	10
70			5	15	2			4	27	3
68	8	5	2			8	11	5		1
66			6					2		3
64	7	5	1			6	7	2		2
62			1							
60	3		3			3	5			1
58			3					2		1
56	4		1		2	5	17	1		11
54			1					3		
52—	14	6	2			7		17		
No. of Cases . .	425	293	285	174	67	345	384	337	309	304

TABLE 350

DISTRIBUTIONS: SUBSTITUTION—INDEX

Girls

PRACTICE PAGE 1

SECONDS	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
80.0−		2								
80.1	5	14	28	40	17	1	2	15	9	10
100.1	30	63	78	55	30	16	25	47	35	42
120.1	72	80	80	36	19	49	85	92	87	73
140.1	81	51	27	20	8	71	71	74	52	31
160.1	66	23	13	5	2	70	53	37	31	20
180.1	31	14	5	3		43	20	15	11	15
200.1	23	5	6	3	1	15	16	7	12	5
220.1	11	1	2		1	11	7	3	2	2
240.1	6					10	4	3		1
260.1	1						1			
280.1	2					4	1			
300+	1					2				
No. of Cases . .	329	253	239	162	78	292	285	293	239	199

PRACTICE PAGE 2

SECONDS	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
60.0−		5	3							
60.1	13	30	27	32	17	4	9	18	13	18
80.1	57	78	91	62	35	40	45	63	57	65
100.1	96	82	61	41	15	68	92	93	79	58
120.1	73	33	29	18	6	68	73	62	45	23
140.1	53	20	17	3	2	59	28	33	25	20
160.1	25	3	6	3		33	19	12	10	10
180.1	9	3	4		1	12	10	7	7	6
200.1	1		1	2		4	3	4	4	
220.1	2		1			7	4	2		
240.1					2					
260.1										
280.1										
300+										
No. of Cases . .	329	254	240	161	78	295	283	294	240	200

TABLE 350—*Continued*

Seconds	X					M				
	Practice Page 3		Memory Page 3			Practice Page 3		Memory Page 3		
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
60–60.1 . . .	1		19	21	10				10	5
60.1	41	76	49	42	17	28	23	42	38	45
80.1	79	84	57	34	34	64	80	74	59	44
100.1	93	49	35	26	5	84	88	46	30	30
120.1	65	33	18	8	1	57	49	24	30	22
140.1	27	9	12	6	4	36	27	17	16	10
160.1	16	2	8	8	4	17	7	17	8	8
180.1	5	1	6	3		1	5	16	4	6
200.1	1		11	6			4	10	5	4
220.1	2		3	2		4		6	7	5
240.1			5	1	1			5	4	3
260.1			3	3				6	5	4
280.1				3	1			4	5	1
300+			12					19	20	12
No. of Cases . .	330	254	238	163	77	291	283	286	241	199

MEMORY PAGE 4

Seconds	X		M	
	14 yrs.	15 yrs.	14 yrs.	15 yrs.
60–	5	24	2	6
60.1	62	81	40	43
80.1	74	49	72	83
100.1	76	34	50	51
120.1	29	26	39	31
140.1	22	14	29	20
160.1	15	6	14	13
180.1	6	8	9	2
200.1	14	4	8	5
220.1	1		4	6
240.1	4	8	7	3
260.1	2		2	8
280.1	21		15	13
No. of Cases . . .	331	254	291	284

TABLE 351

DISTRIBUTIONS: SUBSTITUTION—INDEX

Girls

SUM OF PRACTICE PAGES

SECONDS	X							M							
	14 yrs.	15 yrs.	SECONDS	16 yrs.	SECONDS	17 yrs.	18 yrs.	SECONDS	14 yrs.	15 yrs.	SECONDS	16 yrs.	SECONDS	17 yrs.	18 yrs.
150—			150	8	150—	6	2	150—			150	6	150—		
151			165	15	151	21	10	151			165	7	151		7
176			180	20	176	37	22	176			180	13	176	23	22
201			195	36	201	31	17	201			195	23	201	43	43
226		19	210	44	226	33	13	226		3	210	23	226	60	37
251	17	29	225	28	251	17	7	251	10	6	225	34	251	40	39
276	22	37	240	27	276	5	3	276	13	15	240	40	276	29	15
301	31	31	255	19	301	2	1	301	20	29	255	36	301	21	13
326	34	45	270	7	326	2		326	25	42	270	27	326	9	15
351	37	24	285	10	351	2		351	31	40	285	22	351	3	
376	43	25	300	8	376	1		376	43	37	300	16	376	6	5
401	40	18	315	5	401	1	3	401	36	30	315	14	401	6	3
426	27	10	330	1	426			426	26	20	330	10	426		
451	18	4	345	4				451	27	16	345	7	451		
476	17	4	360					476	17	8	360	2			
501	14	2	375	3				501	11	8	375	5			
526	9	2	390	3				526	11	2	390	1			
551	6		405	1				551	6	6	405	7			
576	5	1						576	6	5					
600	7	1						600	13	11					
No. of Cases	327	252		239		158	78		295	278		293		240	199

TABLE 352

DISTRIBUTIONS: SUBSTITUTION — ACCURACY

Girls

Memory Page

Percents	X					M				
	Page 4		Page 3			Page 4		Page 3		
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
100	142	107	78	69	36	107	123	77	76	53
98	41	43	35	18	12	39	46	47	35	42
96	48	27	17	14	7	31	29	26	22	25
94			14	8	1			17	15	10
92	24	18	13	8	2	23	22	12	5	8
90			10	8	2			12	3	5
88	19	12	4	4	1	26	12	4	4	6
86			7	5	3			5	5	4
84	13	12	10	4	1	13	16	8	8	3
82			3	4	2			7	7	4
80	13	10	5	4	1	14	7	6	10	3
78			6	2	3			9	4	6
76	7	5	4	1	1	11	6	4	3	2
74			4	2				10	9	4
72	4	4	2	1	1	7	5	1		3
70			1	1				5	6	1
68	2	4	3		1	5	3	2		2
66								6	3	3
64	3	3	5	1		4	2	1	4	4
62			3					3	1	1
60	7	3	2			3	1	2		
58			2	1				2	5	
56	1	6	1		4	5	13	1		11
54			2	2				18	6	
52–	7		9	2		7			11	
No. of Cases	331	254	240	159	78	295	285	285	242	200

TABLE 353

DISTRIBUTIONS: MEMORY — PER CENT CORRECT

Boys

7-PLACE SERIES

X

PERCENTS	14 yrs.	15 yrs.	17 yrs.	PERCENTS	16 yrs.	18 yrs.
100	165	167	113	100	198	48
95.5	92	59	31	92.9	45	10
90.5	76	26	14	89.3	7	1
85.5	20	5	4	85.7	15	2
80.5	22	11	6	82.2	3	
75.5	26	9	5	78.6	5	3
70.5	5	5	1	75.0	4	
65.5	5	7	1	71.4	3	1
60.5	4	1	2	67.9	1	
55.5	5	2		64.3	1	
50.5	3	2		60.7	3	
45.5	2		1	57.1	1	
40.5—	1			53.6		
				50.0— . . .		
No. of Cases . . .	426	294	178		286	65

M

PERCENTS	14 yrs.	15 yrs.	17 yrs.	PERCENTS	16 yrs.	18 yrs.
100	118	168	151	100	200	195
95.5	102	75	74	92.9	70	68
90.5	70	62	29	89.3	11	6
85.5	13	13	6	85.7	23	23
80.5	32	20	17	82.2	11	10
75.5	34	19	17	78.6	13	8
70.5	7	3	3	75.0	2	5
65.5	18	10	4	71.4	9	2
60.5	3	7		67.9	1	4
55.5	7		1	64.3	1	2
50.5	12		1	60.7		3
45.5	2		1	57.1		2
40.5—	1			53.6		
				50.0— . . .	3	2
No. of Cases . . .	419	377	304		344	300

TABLE 353—*Continued*

8-Place Series

X

Percents	14 yrs	15 yrs.	17 yrs	Percents	16 yrs	18 yrs
100	85	80	86	100	114	36
95.5	59	52	37	93.8	62	8
90.5	32	29	15	90.6	9	1
85.5	50	29	14	87.5	25	10
80.5	21	14	2	84.4	14	1
75.5	53	33	8	81.3	17	1
70.5	37	17	8	78.1	9	
65.5	21	7	3	75.0	13	3
60.5	30	13	4	71.9	2	1
55.5	11	7		68.8	3	
50.5	15	7	1	65.6	5	
45.5	4	1		62.5	1	
40.5−	8	4		59.4	4	1
				50.3− . . .	8	3
No. of Cases . . .	426	293	178		286	65

M

Percents	14 yrs.	15 yrs.	17 yrs.	Percents	16 yrs	18 yrs
100	51	71	96	100	112	118
95.5	57	49	57	93.8	46	51
90.5	31	36	33	90.6	8	5
85.5	41	33	35	87.5	39	26
80.5	21	25	11	84.4	12	14
75.5	54	55	20	81.3	22	11
70.5	51	40	16	78.1	17	15
65.5	20	13	5	75.0	14	13
60.5	38	24	16	71.9	14	6
55.5	8	7	4	68.6 . . .	15	11
50.5	26	10	4	65.5	7	11
45.5	10	5	7	62.5	7	4
40.5−	12	8		59.4	22	8
				50.3− . . .	11	7
No. of Cases . . .	420	376	304		346	300

TABLE 353—*Continued*

9-PLACE SERIES

X

PERCENTS	14 yrs.	15 yrs.	17 yrs.	PERCENTS	16 yrs	18 yrs
100	26	34	56	100	36	17
95.5	37	27	20	94.4	49	3
90.5	38	30	30	91.7	7	2
85.5	35	37	10	88.9	24	10
80.5	21	15	22	86.1	18	4
75.5	59	31	7	83.3	23	6
70.5	54	35	9	80.6	13	3
65.5	53	28	9	77.8	19	2
60.5	36	25	4	75.0	7	2
55.5	13	6	4	72.2	19	5
50.5	20	13	4	69.4	15	
45.5	18	9	2	66.7	13	3
40.5	8	2		63.9	9	2
35.5	7	2		61.1	9	2
30.0−	1		1	58.3	5	
				55.6	4	2
				52.8	3	1
				50.0	2	
				47.2	6	
				44.4	3	
				41.6	2	
				38.8		
No. of Cases . . .	426	294	178		286	64

M

PERCENTS	14 yrs.	15 yrs.	17 yrs.	PERCENTS	16 yrs.	18 yrs.
100	24	23	40	100	29	48
95.5	23	31	35	94.4	34	36
90.5	22	31	46	91.7	6	5
85.5	37	35	26	88.9	30	30
80.5	21	13	24	86.1	8	9
75.5	49	47	32	83.3	15	20
70.5	38	37	21	80.6	20	19
65.5	48	34	23	77.8	23	20
60.5	52	40	17	75.0	20	9
55.5	26	21	11	72.2	16	13
50.5	33	32	9	69.4	22	11
45.5	30	16	6	66.7	21	10
40.5	10	17	4	63.9	19	7
35.5	7		3	61.1	11	11
30.5−	10		6	58.3	19	9
				55.6	8	7
				52.8	10	10
				50.0	10	7
				47.2	6	3
				44.4	5	5
				41.6	3	3
				38.8	11	8
No. of Cases . . .	420	377	303		346	300

TABLE 354

DISTRIBUTIONS: MEMORY — SUM OF 7-, 8-, 9-PLACE SERIES

Boys

Percents	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
300	14	20	25	40	12	10	13	16	27	38
299	21	18	37	14	7	14	16	25	24	32
289	33	35	61	34	13	24	25	44	39	40
279	30	32	36	22	5	18	30	41	39	38
269	34	37	35	16	10	35	35	42	26	26
259	48	32	23	14	4	28	36	35	25	26
249	42	30	24	11	3	46	43	35	26	23
239	42	20	12	6	4	43	42	23	23	24
229	39	27	12	6	2	38	34	21	15	14
219	41	10	11	7	2	28	24	24	15	11
209	27	7	5	1	2	27	25	16	16	6
199	21	4		2		31	20	5	8	8
189	10	6	2	2		22	12	6	8	4
179	8	5				21	8	5	3	3
169	6	7	1			11	3	2	1	2
159–	10	3	1		1	22	11	3	4	3
No. of Cases	426	293	285	175	65	418	377	343	299	298

TABLE 355

DISTRIBUTIONS: MEMORY — PER CENT CORRECT

Girls

7-Place Series

X

Percents	14 yrs.	15 yrs.	17 yrs.	Percents	16 yrs.	18 yrs.
100	137	143	118	100	171	58
95.5	70	46	23	92.9	42	11
90.5	48	22	15	89.3	5	
85.5	8	9	1	85.7	9	3
80.5	23	12	3	82.2	5	
75.5	25	11	3	78.6	5	1
70.5	5	2	1	75.0		2
65.5	7	3	1	71.4		1
60.5	2			67.9	1	1
55.5	1			64.3	1	
50.5	2	2		60.7		
45.5	2			57.1		
40.5–				53.6		
				50.0–		
No. of Cases	330	250	165		239	77

M

Percents	14 yrs.	15 yrs.	17 yrs.	Percents	16 yrs.	18 yrs.
100	104	147	131	100	179	124
95.5	74	42	41	92.9	55	40
90.5	50	48	19	89.3	7	2
85.5	14	6	12	85.7	23	11
80.5	22	15	14	82.2	5	3
75.5	19	9	17	78.6	12	4
70.5	16	4	2	75.0	2	3
65.5	10	6	5	71.4	2	7
60.5	5	3	2	67.9	3	3
55.5	1			64.3	2	2
50.5	7			60.7	2	
45.5	1			57.1	1	2
40.5–	1			53.6	2	
				50.0–	1	
No. of Cases	324	280	243		296	201

TABLE 355—*Continued*

8-Place Series

X

Percents	14 yrs.	15 yrs.	17 yrs.	Percents	16 yrs.	18 yrs.
100	60	77	75	100	97	49
95.5	52	35	42	93.8	39	8
90.5	29	27	17	90.6	7	
85.5	35	17	7	87.5	25	6
80.5	16	12	2	84.4	12	1
75.5	44	22	9	81.3	11	9
70.5	34	26	6	78.1	3	
65.5	7	10	3	75.0	13	2
60.5	17	13	2	71.9	6	1
55.5	8	6		68.8	5	
50.5	15	1	1	65.6	6	
45.5	6			62.5	3	
40.5–	7	4	1	59.4	3	1
				50.3–	9	1
No. of Cases	330	250	165		239	78

M

Percents	14 yrs.	15 yrs.	17 yrs.	Percents	16 yrs.	18 yrs.
100	47	54	69	100	99	85
95.5	47	46	53	93.8	50	34
90.5	27	27	26	90.6	10	4
85.5	36	30	28	87.5	29	20
80.5	14	18	12	84.4	14	4
75.5	44	35	20	81.3	20	11
70.5	25	21	16	78.1	13	5
65.5	17	4	4	75.0	6	11
60.5	24	16	9	71.9	9	6
55.5	10	6		68.8	8	6
50.5	16	13	2	65.6	4	5
45.5	11	8	4	62.5	9	1
40.5–	7	2		59.4	21	6
				50.3–	4	3
No. of Cases	325	280	243		296	201

TABLE 355—*Continued*

9-PLACE SERIES

X

PERCENTS	14 yrs.	15 yrs.	17 yrs.	PERCENTS	16 yrs.	18 yrs.
100	29	23	41	100	36	26
95.5	26	29	31	94.4	30	5
90.5	37	21	22	91.7	8	3
85.5	41	25	19	88.9	25	14
80.5	26	22	7	86.1	9	4
75.5	39	26	9	83.3	16	7
70.5	27	24	14	80.6	12	1
65.5	32	30	10	77.8	20	5
60.5	26	18	5	75.0	14	1
55.5	11	6	4	72.2	11	3
50.5	12	12	3	69.4	15	
45.5	15	4		66.7	9	5
40.5	4	6		63.9	6	1
35.5	1	4		61.1	2	2
30.5–	4			58.3	5	
				55.6	5	
				52.8	4	
				50.0	1	
				47.2	3	
				44.4	4	
				41.6	1	
				–38.8	3	
No. of Cases . . .	330	250	165		239	77

M

PERCENTS	14 yrs.	15 yrs.	17 yrs.	PERCENTS	16 yrs.	18 yrs.
100	12	14	36	100	25	32
95.5	33	25	42	94.4	24	26
90.5	21	24	25	91.7	4	4
85.5	22	37	25	88.9	24	22
80.5	17	18	13	86.1	16	12
75.5	39	26	27	83.3	23	16
70.5	37	23	17	80.6	17	10
65.5	34	31	14	77.8	24	10
60.5	29	29	17	75.0	12	13
55.5	13	12	2	72.2	26	10
50.5	24	18	9	69.4	16	7
45.5	19	8	9	66.7	5	4
40.5	8	14	3	63.9	11	7
35.5	9			61.1	7	5
30.5–	6		4	58.3	11	9
				55.6	11	2
				52.8	10	3
				50.0	7	3
				47.2	6	1
				44.4	5	4
				41.6	3	2
				38.8	9	
No. of Cases . . .	323	279	243		296	202

TABLE 356

DISTRIBUTIONS: MEMORY — SUM OF 7-, 8-, 9-PLACE SERIES

Girls

PERCENTS	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
300	14	18	26	29	20	6	9	16	24	20
299	15	13	24	19	7	11	10	19	18	21
289	28	32	44	33	20	25	34	48	41	42
279	27	28	31	26	9	18	15	36	25	22
269	37	29	30	11	5	25	39	39	29	27
259	34	14	20	15	7	30	32	27	19	20
249	38	23	24	11	2	32	21	32	17	10
239	25	25	15	5	1	27	23	15	15	11
229	24	15	10	5	4	36	19	19	13	9
219	28	23	7	3	1	22	23	10	11	6
209	25	12	4	3		20	19	10	9	3
199	13	5	2		1	18	12	7	10	4
189	7	6	2	2		13	7		4	3
179	3	1				14	6	5	2	
169	4	3				6	5	2	3	3
159—	7	3				20	5	4	1	1
No. of Cases	329	250	239	162	77	323	279	289	241	202

TABLE 357 — DISTRIBUTIONS: SENTENCES — INDEX OF IDEAS

Boys

X					M				
SECONDS	14 yrs.	15 yrs.	SECONDS	16 yrs.	SECONDS	14 yrs.	15 yrs.	SECONDS	16 yrs.
5—	3	11	4—	3	5—	3		4—	1
5	40	66	4.—5.49	38	5	14	27	4.—5.49	7
6.6	114	111	5.5	52	6.6	66	68	5.5	17
8.6	90	48	6.5	87	8.6	100	86	6.5	74
10.6	68	21	8.5	60	10.6	60	58	8.5	62
12.6	49	15	10.5	19	12.6	55	38	10.5	59
14.6	28	10	12.5	13	14.6	27	23	12.5	36
16.6	9	6	14.5	4	16.6	28	10	14.5	32
18.6	7	1	16.5	1	18.6	8	15	16.5	11
20.6	9		18.5	2	20.6	14	20	18.5	14
22.6			20.5		22.6			20.5	10
24.6	2	1	22.5		24.6	13	5	22.5	7
26.6			24.5		26.6			24.5	2
28.6	2	1	26.5		28.6	6	4	26.5	
30.6			28+	2	30.6			28+	12
32.5	3				32.5+	7	5		
No. of Cases	424	291		281		401	359		344

TABLE 358 — DISTRIBUTIONS: SENTENCES — NUMBER BEGUN IN TWO SECONDS OR LESS

Boys

X					M				
No.	14 yrs.	15 yrs.	No.	16 yrs.	No.	14 yrs.	15 yrs.	No.	16 yrs.
0	28	8	0–1 . .	29	0 . .	20	38	0–1 . .	64
1	22	12	2 . .	38	1 . .	28	22	2 . .	56
2	74	29	4 . .	38	2 . .	94	53	4 . .	64
4	62	26	6 . .	29	4 . .	69	47	6 . .	61
6	68	37	8 . .	29	6 . .	77	63	8 . .	41
8	68	51	10 . .	51	8 . .	59	62	10 . .	35
10	59	66	12 . .	63	10 . .	40	52	12 . .	23
12–13 . . .	49	62			12–13 .	20	30		
No. of Cases	430	291		277		407	367		344

TABLE 359 — DISTRIBUTIONS: SENTENCES — NUMBER CORRECT

Boys

No.	X			M		
	14 yrs.	15 yrs.	16 yrs.	14 yrs.	15 yrs.	16 yrs.
7−				6	4	4
7	4	2		17	2	2
8	5	4		23	8	13
9	20	4	3	46	15	29
10	20	10	7	56	27	26
11	43	23	18	67	44	39
12	93	54	52	93	82	80
13	245	195	202	109	183	152
No. of Cases	430	292	282	417	365	345

TABLE 360 — DISTRIBUTIONS: SENTENCES — NUMBER OF IDEAS

Boys

No.	X			M		
	14 yrs.	15 yrs.	16 yrs.	14 yrs.	15 yrs.	16 yrs.
12−	10	6	3	31	14	8
12	5	3	2	29		9
13	18	17	12	60	51	24
15	25	19	12	67		41
17	32	20	24	55	71	37
19	41	33	26	40		26
21	35	44	24	43	89	34
23	57	29	31	32		35
25	37	26	29	25	63	36
27	36	23	21	8		34
29	40	16	24	15	40	21
31	23	15	24	8		10
33	23	14	13	2	22	13
35	11	10	4	1		11
37	12	4	8	1	15	3
39	3	5	5			1
41	8	1	5			
43	3	2	4	1		
44+	11	4	11			2
No. of Cases	430	291	282	418	365	345

TABLE 361

DISTRIBUTIONS: SENTENCES — INDEX OF IDEAS

Girls

X					M				
Seconds	14 yrs.	15 yrs.	Seconds	16 yrs.	Seconds	14 yrs.	15 yrs.	Seconds	16 yrs.
5–	3	12	4– . .	5	5– . .	1		4– . .	3
5	34	67	4–5.49	43	5 . . .	15	19	4–5.49	10
6.6	81	79	5.55 .	50	6.6 . .	69	57	5.5 . .	21
8.6	62	42	6.5 . .	74	8.6 . .	69	62	6.5 . .	60
10.6	53	22	8.5 . .	32	10.6 . .	53	33	8.5 . .	68
12.6	25	10	10.5 . .	8	12.6 . .	43	20	10.5 . .	40
14.6	18	8	12.5 . .	9	14.6 . .	23	20	12.5 . .	21
16.6	20	2	14.5 . .	2	16.6 . .	19	17	14.5 . .	20
18.6	7	3	16.5 . .	2	18.6 . .	9	7	16.5 . .	14
20.6	10	4	18.5 . .	1	20.6 . .	7	10	18.5 . .	8
24.6	4	2	20.5 . .		24.6 . .	1	2	20.5 . .	7
28.6	1	1	22.5 . .		28.6 . .	6	6	22.5 . .	4
32.6+ . . .	2		24.5 . .		32.6 . .	4	4	24.5 . .	2
			26.5 . .					26.5 . .	1
			28+ . .	1				28+ . .	7
No. of Cases	320	252		227		319	257		286

TABLE 362

DISTRIBUTIONS: SENTENCES — NUMBER BEGUN IN TWO SECONDS OR LESS

Girls

X					M				
No.	14 yrs.	15 yrs.	No.	16 yrs.	No.	14 yrs.	15 yrs.	No.	16 yrs.
0	28	12	0–1 . .	26	0 . . .	14	28	0–1 . .	47
1	19	19	2 . .	31	1 . .	32	27	2 . .	44
2	42	30	4 . .	27	2 . .	58	48	4 . .	46
4	43	28	6 . .	40	4 . .	69	28	6 . .	40
6	61	45	8 . .	30	6 . .	52	44	8 . .	37
8	51	32	10 . .	42	8 . .	58	41	10 . .	49
10	49	36	12 . .	33	10 . .	27	22	12 . .	30
12–13 . . .	39	52			12–13 .	14	21		
No. of Cases	332	254		229		324	259		293

TABLE 363

DISTRIBUTIONS: SENTENCES — NUMBER CORRECT

Girls

No.	X			M		
	14 yrs.	15 yrs.	16 yrs.	14 yrs.	15 yrs.	16 yrs.
7–	2			3	3	2
7	3			6	4	4
8	7			26	13	5
9	13	4	3	28	14	10
10	7	12	8	49	15	21
11	37	18	6	44	26	27
12	85	40	31	92	69	70
13	177	180	183	77	119	154
No. of Cases	331	254	231	325	263	293

TABLE 364

DISTRIBUTIONS: SENTENCES — NUMBER OF IDEAS

Girls

No.	X			M		
	14 yrs.	15 yrs.	16 yrs.	14 yrs.	15 yrs.	16 yrs.
12–	8	2	0	23	11	5
12	2		1	24		7
13	9	12	1	30	32	12
15	14	19	7	52		25
17	19	23	12	46	54	21
19	36	33	13	47		36
21	42	30	29	26	51	26
23	28	33	23	18		37
25	34	19	21	25	58	26
27	41	20	21	16		31
29	26	14	27	7	33	20
31	25	10	16	4		12
33	20	6	15		13	15
35	5	6	11	5		11
37	7	9	8		10	5
39	3	1	9	2		1
41	4	3	3			
43	2	3	4			1
44+	7		11			2
No. of Cases	332	243	232	325	262	293

TABLE 365 — DISTRIBUTIONS: MUTILATED TEXT — TIME

Boys

Seconds	X		M	
	17 yrs.	18 yrs.	17 yrs.	18 yrs.
54–		1		
55–79	1	1		1
80	8	11		8
105	9	8	5	15
130	10	9	6	12
155	17	9	10	20
180	12	3	17	26
205	21	5	18	17
230	11	1	19	22
255	19	4	9	20
280	13	3	21	16
305	13	1	18	20
330	2	3	16	15
355	6	2	22	10
380	5		17	13
405	4		21	6
430	3	2	16	3
455	4		10	3
480	10		66	15
480+	6	2	18	13
No. of Cases	174	65	309	255

TABLE 366 — DISTRIBUTIONS: MUTILATED TEXT — ACCURACY

Boys

Percents	X		M	
	17 yrs.	18 yrs.	17 yrs.	18 yrs.
100–				
95.6	23	9	5	6
95.5	34	6	14	6
90.5	12	5	5	5
85.5	23	10	19	19
80.5	10	3	5	10
75.5	20	13	26	18
70.5	17	4	18	24
65.5	4	6	10	14
60.5	13	6	29	29
55.5	3		17	11
50.5	6	1	31	28
45.5	6	2	26	31
40.5	1		12	10
35.5	4		29	10
30.5			13	2
25.5			18	14
20.5		1	18	8
15.5			15	6
10.5				2
5.5–				4
No. of Cases	176	66	310	257

TABLE 367 — DISTRIBUTIONS: MUTILATED TEXT — TIME

Girls

Seconds	X		M	
	17 yrs.	18 yrs.	17 yrs.	18 yrs.
54–				
55–79	3	5		1
80	9	9		4
105	10	16	5	3
130	17	5	4	16
155	14	7	10	10
180	12	6	10	16
205	10	6	9	9
230	6	3	15	15
255	16	7	12	4
280	13	3	23	14
305	12	1	13	5
330	7	1	15	8
355	6	1	13	10
380	6	1	12	5
405	8		9	6
430	5		11	1
455	2	1	13	1
480	7		58	9
480+			14	
No. of Cases	163	72	246	137

TABLE 368 — DISTRIBUTIONS: MUTILATED TEXT — ACCURACY

Girls

Percents	X		M	
	17 yrs.	18 yrs.	17 yrs.	13 yrs.
100–95.6	23	23	7	3
95.5	41	18	8	4
90.5	22	5	4	4
85.5	23	9	22	11
80.5	8	5	9	4
75.5	20	7	26	14
70.5	7	6	27	18
65.5	4	1	8	10
60.5	8	3	22	17
55.5	3	1	13	5
50.5	2		21	10
45.5			18	15
40.5			8	3
35.5	1	1	17	9
30.5			6	5
25.5	1		13	5
20.5			6	3
15.5			12	2
10.5				2
5.5–				2
No. of Cases	163	79	247	146

TABLE 369 — DISTRIBUTIONS: OPPOSITES

Boys

X

Corrected Percents	Easy 14 yrs.	Easy 15 yrs.	Percents	Easy 18 yrs.	Hard 17 yrs.	Hard 18 yrs.
180–130.6	4	79	100	26	6	6
130.5	43	99	95	13	14	6
110.5	121	51	90	1	16	7
100.5	90	37	85	2	15	9
95.5	63		80	1	16	6
90.5	46	16	75		19	9
85.5	27		70		19	3
80.5	11	4	65		15	5
75.5	6		60		14	3
70.5	5	4	55		10	5
65.5	8		50		8	4
60.5	2	1	45		11	
55.5			40		4	1
50.5		1	35		2	1
45.5	1		30		4	
40.5			25		1	
35.5			20			
30.5		1	15			
25.5–			10			
No. of Cases . . .	427	293		43	174	64

M

Corrected Percents	Easy 14 yrs.	Easy 15 yrs.	Percents	Easy 18 yrs.	Hard 17 yrs.	Hard 18 yrs.
180		51	100	106	1	
130.5		71	95	69	1	
110.5	24	60	90	44	3	6
100.5	32		85	28	5	5
95.5	29	81	80	14	7	5
90.5	43		75	6	9	7
85.5	25	34	70	2	8	2
80.5	23		65	15	25	1
75.5	19	21	60		14	7
70.5	5		55		20	5
65.5	13	5	50		27	2
60.5	10		45		30	7
55.5	8	5	40		23	4
50.5	3		35		35	3
45.5	4	4	30		20	3
40.5	2		25		23	4
35.5	4	2	20		19	2
30.5			15		14	3
25.5–	4		10		8	6
			5		17	
No. of Cases . . .	248	334		284	309	72

TABLE 370 — DISTRIBUTIONS: OPPOSITES

Girls

X

Corrected Percents	Easy 14 yrs.	Easy 15 yrs.	Percents	Easy 18 yrs.	Hard 17 yrs.	Hard 18 yrs.
180–130.6	8	93	100	32	6	12
130.5	67	67	95	7	15	9
110.5	66	50	90	3	27	13
100.5	71	25	85		22	11
95.5	43		80		19	8
90.5	30	10	75		16	6
85.5	18		70		21	9
80.5	7	4	65		11	3
75.5	4		60		9	3
70.5	3	3	55		2	4
65.5	1		50		6	
60.5	3		45		3	
55.5	2		40		2	
50.5	1	1	35		2	1
45.0	1		30		2	
40.5		1	25			
35.5			20			
30.5	2	1	15			
25.5			10			
			5			
No. of Cases . . .	327	225		42	163	79

M

Corrected Percents	Easy 14 yrs.	Easy 15 yrs.	Percents	Easy 18 yrs.	Hard 17 yrs.	Hard 18 yrs.
180		32	100	80		
130.5	2	69	95	51		3
110.5	26	59	90	26	2	3
100.5	39	49	85	21	4	5
95.5	31		80	4	6	5
90.5	31	21	75	4	8	4
85.5	30	9	70	4	7	4
80.5	26		65	5	11	6
75.5	15		60		10	6
70.5	5	6	55		23	4
65.5	9		50		21	8
60.5	6	3	45		22	3
55.5	3		40		21	5
50.5	2	5	35		14	6
45.5	4		30		21	5
40.5		2	25		20	2
35.5	2		20		26	3
30.5		1	15		8	
25.5–	2		10		9	2
			5		11	
No. of Cases . . .	233	256		195	244	74

TABLE 371

DISTRIBUTIONS: CAUSE AND EFFECT — PER CENT CORRECT

Boys — 16 Years

PERCENTS	X	M
100	96	19
99.9–96.7	34	8
96.6	47	29
93.2	20	14
89.9	20	26
86.6	15	11
83.2	22	36
79.9	2	17
76.6	9	22
73.2	3	11
69.9	10	20
66.6	6	7
63.2	2	11
59.9		11
56.6	1	11
53.2	1	4
49.9		14
46.6		8
43.2		6
39.9		4
36.6		15
33.2		1
29.9–	1	12
No. of Cases	289	317

TABLE 372

DISTRIBUTIONS: CAUSE AND EFFECT — PER CENT CORRECT

Girls — 16 Years

Percents	X	M
100	93	43
99.9–96.7	18	5
96.6	38	18
93.2	20	18
89.9	18	34
86.6	9	12
83.2	8	25
79.9	5	15
76.6	6	17
73.2	3	9
69.9	6	13
66.6	2	2
63.2	1	13
59.9	4	10
56.6	4	17
53.2		5
49.9		8
46.6		2
43.2		11
39.9	2	
36.6		4
33.2	1	4
29.9–	1	10
No. of Cases	239	295

TABLE 373

DISTRIBUTIONS: CONSTRUCTION PUZZLES — TIME OF SOLUTION

Boys

X

Seconds	Egg 16 yrs.	Flower-Pot 16 yrs.	Seconds	Chick 17 yrs.	Boat 17 yrs.	Seconds	Cradle 18 yrs.	Seal 18 yrs.
21–30	1	35	30–	1	1	30	1	
31	5	77	30.1	10	18	45	3	
46	4	53	45.1	19	16	60	6	2
61	4	43	60.1	25	12	75	2	1
76	7	21	75.1	20	14	90	6	1
91	5	19	90.1	11	15	105	3	4
106	1	10	105.1	10	13	120	1	
121	12	7	120.1	15	10	135	3	6
151	9	4	150.1	10	7	150	1	1
181	15	4	180.1	6	9	165	4	2
211	8	2	210.1	4	6	180	3	1
241	11	2	240.1	8	7	195	3	2
271	13	1	270.1	5	5	210		2
Failure	181	3	300+	31	38	225	1	1
						240	2	1
						255	3	1
						270	4	
						285	1	1
						300+	16	37
No. of Cases	276	281		175	171		63	63

M

Seconds	Egg 16 yrs.	Flower-Pot 16 yrs.	Seconds	Chick 17 yrs.	Boat 17 yrs.	Seconds	Cradle 18 yrs.	Seal 18 yrs.
0–20		3	30–		1	30	2	3
21–30		11	30.1	14	6	45	5	
31	6	66	45.1	12	15	60	7	1
46	9	65	60.1	20	17	75	12	3
61	4	42	75.1	16	13	90	11	2
76	4	31	90.1	16	8	105	17	6
91	7	17	105.1	15	12	120	9	5
106	3	15	120.1	23	18	135	10	5
121	16	21	150.1	21	16	150	13	8
151	5	15	180.1	18	18	165	4	7
181	13	8	210.1	16	9	180	7	5
211	6	6	240.1	10	9	195	7	7
241	9	3	270.1	9	12	210	5	5
271	7	2	300+	107	94	225	6	8
Failure	183	15				240	6	5
						255	3	8
						270	5	2
						285	10	8
						300+	157	179
No. of Cases	272	320		297	248		296	267

TABLE 374

DISTRIBUTIONS: CONSTRUCTION PUZZLES — TIME OF SOLUTION

Girls

X

SECONDS	Egg 16 yrs.	Flower Pot 16 yrs.	SECONDS	Chick 17 yrs.	Boat 17 yrs.	SECONDS	Cradle 18 yrs.	Bed 18 yrs.
0–20		1	30 −	1		45	2	
21–30	2	28	30 +	5	10	60	5	1
31	5	19	45 +	13	15	75	1	1
46	1	39	60 +	12	11	90	3	3
61	5	29	75 +	9	17	105	1	4
76	1	18	90 +	8	7	120	5	1
91	1	12	105 +	12	12	135	2	1
106	6	9	120 +	19	11	150	6	1
121	8	18	150 +	11	11	165	2	4
151	4	8	180 +	9	15	180	6	1
181	4	5	210 +	17	1	195	3	3
211	10	1	240 +	4	1	210	2	2
241	11	2	270 +	9	6	225	1	1
271	7	1	300 +	31	31	240	1	5
300+	158	11				255	2	2
						270	1	
						285		2
						300 +	27	36
No. of Cases	223	231		160	157		76	71

M

SECONDS	Egg 16 yrs.	Flower Pot 16 yrs.	SECONDS	Chick 17 yrs.	Boat 17 yrs.	SECONDS	Cradle 18 yrs.	Bed 18 yrs.
0–20			30 −		1	45 −	5	1
21–30		13	30 +	6	3	60	7	3
31	4	25	45 +	11	9	75	9	1
46	5	45	60 +	11	6	90	5	2
61	4	41	75 +	10	7	105	10	3
76	2	26	90 +	14	8	120	9	4
91	1	20	105 +	11	9	135	3	3
106	1	11	120 +	17	12	150	11	3
121	3	22	150 +	21	8	165	6	2
151	4	14	180 +	9	4	180	13	2
181	8	10	210 +	15	9	195	9	3
211	7	9	240 +	7	7	210	1	1
241	4	4	270 +	10	4	225	2	
271	6	4	300 +	83	99	240	7	4
300+	141	11				255	6	3
						270	2	1
						285		5
						300 +	136	117
No. of Cases	190	261		237	186		217	158

TABLE 375

DISTRIBUTIONS: PUZZLE BOXES

Boys

X								M							
Healy-Fernald				Instruction Box		Freeman Puzzle Box		Healy-Fernald				Instruction Box		Freeman Puzzle Box	
Seconds	15 yrs.	Seconds	16 yrs.	No. of Trials	17 yrs.	Seconds	18 yrs.	Seconds	15 yrs.	Seconds	16 yrs.	No. of Trials	17 yrs.	Seconds	18 yrs.
100–	33	50–	4	1	97	20		100–	16	50–	3	1	102	20	
100–200	127	51	26	2	56	30.1	1	100	69	51	22	2	111	30.1	4
201	52	76	55	3	10	40.1	1	201	83	76	39	3	53	40.1	7
301	33	101	33	Failure	4	50.1	2	301	55	101	39	Failure	31	50.1	3
401	12	126	38			60.1	5	401	23	126	28			60.1	9
501	9	151	23			70.1	1	501	16	151	33			70.1	13
600+	24	176	21			80.1	5	600+	78	176	31			80.1	14
		201	13			90.1	3			201	25			90.1	8
		226	14			100.1	6			226	12			100.1	12
		251	12			110.1	5			251	11			110.1	10
		276	11			120.1	2			276	7			120.1	7
		301	5			130.1	1			301	17			130.1	10
		351	4			140.1				351	8			140.1	8
		401	8			150.1	2			401	7			150.1	8
		501	5			160.1	2			501	4			160.1	9
		601	1			170.1	3			601	3			170.1	10
		720+				180.1	1			720+	21			180.1	5
						190.1								190.1	3
						200.1								200.1	9
						210.1								210.1	3
						220.1								220.1	5
						230.1	2							230.1	7
						240.1								240.1	1
						250.1	1							250.1	2
						260.1	2							260.1	6
						270.1								270.1	2
						280.1								280.1	4
						290.1	1							290.1	2
						300+	8							300+	101
No. of Cases	290		273		167		54		340		310		297		282

TABLE 376

DISTRIBUTIONS: PUZZLE BOXES

Girls

X								M							
Healy-Fernald				Instruction Box		Freeman Puzzle Box		Healy-Fernald				Instruction Box		Freeman Puzzle Box	
Seconds	15 yrs.	Seconds	16 yrs.	No. of Trials	17 yrs.	Seconds	18 yrs.	Seconds	15 yrs.	Seconds	16 yrs.	No. of Trials	17 yrs.	Seconds	18 yrs.
100–	10	50–		1	96	20	3	100–	1	50–	2	1	57	20	
100–200	53	51	10	2	33	30.1		100	15	51	6	2	64	30.1	
201	48	76	16	3	13	40.1		201	36	76	9	3	45	40.1	1
301	41	101	19	Failure	8	50.1		301	29	101	20	Failure	45	50.1	
401	25	126	23			60.1	1	401	31	126	17			60.1	3
501	17	151	20			70.1	1	501	16	151	13			70.1	1
600+	55	176	17			80.1	1	600+	129	176	19			80.1	4
		201	21			90.1	4			201	14			90.1	2
		226	18			100.1	1			226	6			100.1	4
		251	10			110.1	3			251	9			110.1	8
		276	9			120.1	1			276	9			120.1	
		301	8			130.1	3			301	13			130.1	4
		351	13			140.1	3			351	9			140.1	1
		401	9			150.1	1			401	12			150.1	1
		501	2			160.1	2			501	8			160.1	2
		601	3			170.1	1			601	6			170.1	4
		720+	5			180.1	2			720+	38			180.1	1
						190.1	3							190.1	4
						200.1	1							200.1	3
						210.1	1							210.1	1
						220.1								220.1	5
						230.1	2							230.1	5
						240.1	2							240.1	3
						250.1	1							250.1	2
						260.1	1							260.1	
						270.1								270.1	2
						280.1	1							280.1	3
						290.1	2							290.1	4
						300+	25							300+	98
No. of Cases	249		203		150		66		257		210		211		166

TABLE 377

DISTRIBUTIONS: RECOGNITION

Boys — 18 Years

No. of Errors	+Errors		−Errors		Per Cent Correct		
	X	M	X	M		X	M
10					100 . . .		1
9					90 . . .	11	3
8		3			80 . . .	15	13
7		6			70 . . .	12	42
6		21		2	60 . . .	12	59
5		38	1	3	50 . . .	8	77
4	9	67	1	17	40 . . .	6	46
3	12	71	9	34	30 . . .	2	25
2	20	51	12	81	20 . . .		12
1	20	27	23	104	10 . . .		10
0	5	8	20	51	0 . . .		2
					— . . .		2
No. of Cases	66	292	66	292		66	292

TABLE 378

DISTRIBUTIONS: RECOGNITION

Girls — 18 Years

No. of Errors	+Errors		−Errors		Per Cent Correct		
	X	M	X	M		X	M
10	1	2	1		100 . . .		
9		1		1	90 . . .	2	1
8		1			80 . . .	17	13
7		9			70 . . .	17	17
6	5	23		2	60 . . .	12	47
5	8	33		3	50 . . .	13	32
4	11	44	2	10	40 . . .	4	31
3	13	40	7	27	30 . . .	4	36
2	20	30	13	50	20 . . .	3	16
1	8	19	26	70	10 . . .	1	6
0	7	2	24	41	0 . . .		2
—					— . . .		3
No. of Cases	73	204	73	204		73	204

TABLE 379 — DISTRIBUTIONS: AUSSAGE — PER CENT CORRECT IDEAS

Boys — 18 Years

Percents	X	M
100–96	1	
95–91		3
90	1	7
85	6	11
80	5	22
75	4	22
70	17	37
65	9	50
60	7	43
55	5	27
50	2	20
45	3	25
40		8
35		5
30		6
25		4
20		4
15		
10		
6–		
No. of Cases	60	295

TABLE 380 — DISTRIBUTIONS: AUSSAGE — PER CENT CORRECT IDEAS

Girls — 18 Years

Percents	X	M
100–96		
95–91	1	2
90	3	3
85	9	8
80	5	11
75	15	23
70	13	22
65	12	16
60	5	17
55	2	25
50	6	20
45	1	16
40	2	12
35	1	9
30	1	4
25		9
20		2
15		
10		2
6–	1	
No. of Cases	77	201

TABLE 381 — DISTRIBUTIONS: HARD DIRECTIONS

Boys — 18 Years

Seconds	Time		No.	Number Correct	
	X	M		X	M
106–120	16	3	20	18	7
121–135	6	7	19	20	14
136	9	13	18	12	34
151	6	16	17	7	27
166	8	16	16	3	33
181	4	20	15	2	35
196	3	22	14		23
211	2	20	13		27
226	4	16	12	1	17
241	1	25	11		21
256	1	21	10	1	16
271		15	9		15
286		14	8		9
301	3	33	7–	1	16
361	1	22			
421		18			
481		6			
541+		7			
No. of Cases	64	294		65	294

TABLE 382 — DISTRIBUTIONS: HARD DIRECTIONS

Girls — 18 Years

Seconds	Time		Number	Number Correct	
	X	M		X	M
106–120	23	6	20	31	13
121–135	12	9	19	20	15
136	8	13	18	12	26
151	2	12	17	5	24
166	7	20	16	4	28
181	5	15	15	3	29
196	1	10	14	1	15
211	7	23	13		12
226	3	12	12		10
241	2	14	11	1	11
256	2	11	10		7
271		8	9		3
286	1	11	8		5
301	2	18	7–		2
361	1	6			
421		4			
481		3			
541+		3			
No. of Cases	76	198		77	200

TABLE 383

DISTRIBUTIONS: YERKES POINT SCALE IN SCORES

Boys — 18 Years

Point Score	X	M
100–96	15	2
95–91	19	7
90–86	12	18
85–81	2	45
80–76	1	28
75–71		30
70–66		15
65–61		7
60–56		7
55–51		
50–46		
45–41		
40+40–		
	49	159
Omitted	19	146
No. of Cases	68	305

TABLE 384

DISTRIBUTIONS: YERKES POINT SCALE IN SCORES

Girls — 18 Years

Point Score	X	M
100–96	9	3
95–91	23	11
90–86	9	18
85–81	1	24
80–76	1	17
75–71		16
70–66		8
65–61		8
60–56		5
55–51		1
50–46		3
45–41		
40–40–		
	43	114
Omitted	41	92
No. of Cases	84	206

TABLE 385

DISTRIBUTIONS: MENTAL TESTS — AVERAGE PERCENTILE RANK

Boys

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10–						2				
11						6	3	5	1	
16	2	1				12	10	7	3	4
21	3	1				28	17	18	11	6
26	9	3	3	1		31	20	30	22	15
31	13	13	3			40	51	37	39	15
36	22	12	7	2		41	50	46	37	29
41	38	10	18	7	3	40	52	43	45	34
46	39	16	27	10	1	53	52	41	36	35
51	45	37	35	18		47	42	44	32	35
56	49	42	33	14	3	37	39	27	28	39
61	55	39	38	18	9	36	21	19	24	26
66	61	34	42	42	12	21	13	12	14	19
71	41	33	34	23	13	25	10	10	6	24
76	18	28	30	18	11	10	6	5	9	12
81	24	19	11	14	14	10	3	2	2	6
86	11	7	7	6		2		1	2	4
91		1	2	3	1					
96										
No. of Cases . .	430	296	290	176	67	441	389	347	311	303

TABLE 386

DISTRIBUTIONS: MENTAL TESTS — AVERAGE PERCENTILE RANK

Girls

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10–						3				
11			2			3	4	2		
16	1	1				10	9	10	11	3
21	3	1				15	12	21	14	5
26	8	4	6	1		15	21	14	23	14
31	11	6	9	1		29	28	33	21	18
36	22	14	7	2	2	37	26	29	30	16
41	25	18	18	3		35	46	41	27	26
46	24	32	14	11	2	37	35	39	33	27
51	36	30	18	16	7	41	26	25	28	29
56	42	23	31	15	10	25	28	26	17	16
61	40	37	43	20	8	29	26	25	18	17
66	37	30	32	25	10	23	11	12	11	20
71	41	23	18	21	17	13	7	9	9	8
76	16	23	16	25	12	16	7	6	2	2
81	17	9	10	16	3	2		2	1	3
86	6	4	16	5	7	1				1
91	1	1	1	1	1					
96					1					
No. of Cases . .	330	256	241	162	80	334	286	294	245	205

CHAPTER VI

MENTAL AND PHYSICAL GROWTH FROM FOURTEEN TO EIGHTEEN YEARS

In discussing the data with regard to mental and physical growth from year to year, only tables of differences between percentile scales from year to year will be presented. The percentile scales from which the differences have been taken are to be found in Chapters III, IV, and V. Both differences between five-percentile scales for the entire group from year to year and differences between the ten-percentile scales for working and school children separately will be given. Since at year sixteen a new group of children was added to the school series, it seemed possible that the yearly differences in which year sixteen was involved might be modified in ways not related to yearly growth. The labor of making separate percentiles for the X_1 and X_2 series for every test was too great to undertake unless it promised to yield important results. The average percentile ranks for the two series were compared (see Chapter V) and presented no differences sufficiently large or consistent to be considered important factors. The X_1 and X_2 series were also estimated separately for several mental tests and the results will be presented in this chapter when these tests are discussed.

YEARLY GAINS IN PHYSICAL TESTS

Height

The five-percentile differences in height from year to year for the entire group of boys are shown in Table 387. The ten-percentile differences for school boys (X) and working boys (M) separately are given in Table 388. The greatest gain in height for boys occurs in the year fourteen to fifteen, with a median gain of 5.9 cm. The year sixteen to seventeen shows a much smaller median gain—3.8 cm., and the year seventeen to eighteen least of all—only 1.4 cm. It is interesting to note that in the year fourteen to fifteen the gain is greatest among the tall boys, while in the years fifteen to sixteen and sixteen to seventeen it is greatest among the short boys. In the year seventeen to eighteen no difference appears between the upper and lower halves of the scale. The inference is that tall boys get their growth earlier than short ones. The year between sixteen and seventeen is the one which shows the greatest contrast between the upper and lower halves of the scale. In other words, the year between sixteen and seventeen is one of much more importance in the growth of boys who are below average in height than it is for those above average.

TABLE 387

HEIGHT: YEARLY DIFFERENCES IN CENTIMETERS BETWEEN THE FIVE-PERCENTILE SCALES

Boys

Percentiles	15–14	16–15	17–16	18–17
5	5.0	6.1	7.3	1.3
10	5.2	6.7	5.6	1.8
15	5.7	6.7	5.6	1.3
20	5.9	5.8	4.9	1.5
25	6.2	6.5	4.6	1.8
30	6.6	6.1	4.4	1.9
35	6.7	6.2	4.1	1.7
40	6.7	6.2	3.9	1.6
45	6.8	6.1	3.8	1.6
50	6.8	5.9	3.8	1.4
55	6.9	5.7	3.7	1.4
60	7.1	5.5	3.7	1.4
65	7.1	5.5	3.4	1.4
70	7.0	5.4	3.3	1.3
75	7.0	5.2	3.1	1.3
80	7.0	5.1	2.7	1.5
85	6.8	5.0	2.3	1.8
90	7.0	4.8	2.5	1.2
95	7.0	4.2	1.5	2.2

TABLE 388

HEIGHT: YEARLY DIFFERENCES IN CENTIMETERS BETWEEN THE TEN-PERCENTILE SCALES

Boys

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	6.8	8.6	4.2	2.2	5.9	5.7	6.8	1.7
20	7.0	6.9	3.6	2.4	6.3	5.9	6.4	1.5
30	7.0	7.3	3.0	1.8	6.7	5.9	5.5	2.1
40	7.5	6.5	2.9	1.4	7.0	5.6	5.3	1.9
50	7.8	5.6	3.1	1.2	7.0	5.5	5.0	1.8
60	7.8	5.7	2.6	1.6	6.3	6.0	4.8	1.8
70	7.7	5.6	2.3	2.1	7.1	5.1	4.7	1.8
80	7.6	5.0	2.2	2.5	6.7	4.7	4.5	1.5
90	6.3	4.8	1.6	3.0	6.8	3.5	4.5	1.8

TABLE 389

HEIGHT: YEARLY DIFFERENCES IN CENTIMETERS BETWEEN THE FIVE-PERCENTILE SCALES

Girls

Percentiles	15–14	16–15	17–16	18–17
5	3.7	1.4	2.2	.2
10	3.1	2.0	1.2	.3
15	3.3	1.8	1.3	.5
20	3.1	2.4	1.0	.3
25	3.0	2.4	.7	.6
30	2.9	2.0	1.0	.7
35	2.8	2.1	.8	.8
40	2.8	2.2	.8	.8
45	2.8	2.3	.8	.7
50	2.6	2.3	.8	.7
55	2.4	2.3	.9	.5
60	2.3	2.3	.9	.5
65	2.2	2.4	.9	.4
70	2.5	2.0	1.0	.5
75	2.8	1.6	1.3	.5
80	2.8	1.8	1.1	.5
85	2.8	1.8	.8	.6
90	3.0	1.5	.9	.9
95	2.3	2.7	.6	.4

TABLE 390

HEIGHT: YEARLY DIFFERENCES IN CENTIMETERS BETWEEN THE TEN-PERCENTILE SCALES

Girls

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	2.8	2.2	1.6	−.6	3.6	1.9	1.2	.6
20	3.2	3.0	.9	.4	2.2	2.8	1.4	.4
30	2.9	2.5	1.2	1.1	2.9	1.8	1.0	.6
40	2.9	2.4	1.2	.9	2.9	1.8	.9	.7
50	3.2	2.4	1.2	.5	2.5	2.1	.9	.6
60	2.6	2.0	1.4	.2	2.2	2.5	.8	.5
70	2.7	1.8	1.4	.0	2.2	2.0	1.2	.6
80	3.1	1.9	1.2	.0	2.6	1.7	1.3	.6
90	3.2	1.6	1.6	.0	2.8	1.4	.6	1.4

A comparison of the ten-percentile differences for working and school boys bears out this interpretation. For school boys, who are taller than working boys, the years of most rapid gain in height are from fourteen to sixteen. The year sixteen to seventeen shows a gain, but decidedly less in amount than the previous years. Among working boys the year sixteen to seventeen shows almost as rapid a gain as the two previous years.

Since between seventeen and eighteen there is still a gain of about a centimeter and a half in height, these tables do not show at what age this group of boys ceases to gain in height. However, since the rate of gain is so much less between seventeen and eighteen than in any previous year, it is safe to assume that adult height has been almost reached at eighteen years. The next year or two would probably show increases of fractions of centimeters.

The differences in the five-percentile scales of girls from year to year are given in Table 389. The yearly differences in the ten-percentile scales for working and school girls separately are shown in Table 390. The girls present a very different picture with regard to growth in height during these years from the boys. For them the period of most rapid yearly gain is over before they reach the age of fourteen. Between fourteen and sixteen they gain about 2.5 cm. a year, as against 6.5 cm. for the boys. After sixteen, the median gain is about .75 cm. The tendency toward a more rapid yearly gain for the shorter children shows among girls only in the year fourteen to fifteen. Girls between fourteen and fifteen are almost as near their adult height as boys between sixteen and seventeen. The phenomenon of a belated period of rapid growth among short children is evident, accordingly, in year fourteen to fifteen for girls and in year sixteen to seventeen for boys.

There are no differences discernible in the yearly rate of gain between school girls and working girls except a slightly greater gain among school girls between fifteen and sixteen, which may be due to the addition of the new group of girls at sixteen (see Chapter II).

The tables indicate that eighteen years is very close to an adult height for girls. The gain between seventeen and eighteen is only about .5 cm. for the group as a whole.

WEIGHT

The yearly differences in the five-percentile scales for weight among boys are given in Table 391. The yearly differences in the ten-percentile scales for school boys and working boys separately are given in Table 392. The state of affairs is similar to that found in height. The median gain in weight is large between fourteen and sixteen. It is 6.6 kilograms and 5.8 kilograms in the two successive years. In the year sixteen to seventeen it

TABLE 391

WEIGHT: YEARLY DIFFERENCES IN KILOGRAMS BETWEEN THE FIVE-PERCENTILE SCALES

Boys

Percentiles	15–14	16–15	17–16	18–17
5	4.0	4.6	6.2	2.4
10	4.4	5.0	5.7	3.1
15	4.8	5.6	5.5	2.5
20	5.2	5.4	5.4	2.0
25	5.2	5.6	5.1	2.9
30	5.5	5.8	4.6	1.9
35	5.8	5.7	4.2	2.1
40	6.1	5.8	4.8	2.2
45	6.3	5.8	3.6	2.0
50	6.6	5.8	3.3	1.9
55	6.7	5.7	2.9	2.2
60	6.9	5.5	3.1	1.9
65	7.0	5.5	2.8	2.0
70	7.1	5.4	2.7	2.0
75	6.8	5.4	2.5	2.1
80	6.5	5.8	2.4	2.2
85	5.7	6.7	1.8	2.1
90	4.0	7.4	1.4	2.1
95	5.4	6.3	.3	1.9

TABLE 392

WEIGHT: YEARLY DIFFERENCES IN KILOGRAMS BETWEEN THE TEN-PERCENTILE SCALES

Boys

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	3.7	7.4	4.9	4.1	4.8	4.4	6.0	3.6
20	5.6	5.6	4.0	2.9	4.9	5.1	6.5	2.2
30	5.5	6.4	3.5	2.8	5.1	5.3	5.8	1.9
40	6.3	6.1	3.1	2.4	5.8	5.7	4.8	2.4
50	6.7	5.9	2.7	2.4	6.4	5.6	4.4	2.3
60	6.8	5.9	2.5	3.7	6.8	5.4	4.4	2.3
70	6.1	6.4	2.9	2.9	6.9	4.7	4.6	2.3
80	6.1	6.4	2.7	2.1	7.0	3.6	4.9	2.8
90	4.0	6.2	2.5	3.5	6.1	5.4	2.8	3.0

TABLE 393

WEIGHT: YEARLY DIFFERENCES IN KILOGRAMS BETWEEN THE FIVE-PERCENTILE SCALES

Girls

PERCENTILES	15–14	16–15	17–16	18–17
5	4.0	2.3	4.9	−1.5
10	4.3	2.2	2.8	− .6
15	4.3	2.3	2.0	− .4
20	4.3	2.5	1.7	− .4
25	4.3	2.2	1.6	− .2
30	4.3	2.0	1.6	− .1
35	4.2	2.1	1.7	− .2
40	4.0	2.3	1.7	− .2
45	4.0	2.3	1.6	− .1
50	3.9	2.4	1.5	0
55	4.3	2.6	1.3	.1
60	3.9	2.5	1.4	0
65	3.9	2.6	1.3	− .2
70	4.0	2.8	1.3	− .6
75	4.1	3.2	1.2	− .9
80	3.9	3.1	1.3	−1.1
85	3.6	3.2	1.5	− .6
90	2.9	4.7	.7	− .3
95	6.7	2.5	.8	+1.5

TABLE 394

WEIGHT: YEARLY DIFFERENCES IN KILOGRAMS BETWEEN THE TEN-PERCENTILE SCALES

Girls

PERCENTILES	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	3.1	2.7	3.2	−1.9	4.5	2.7	2.4	.3
20	3.2	3.2	1.6	−1.2	4.5	2.5	1.8	− .1
30	3.0	3.0	1.1	0.0	4.7	1.9	2.2	− .4
40	2.6	3.4	1.1	− .2	4.4	2.1	2.3	− .3
50	2.5	3.5	.9	− .2	4.2	2.3	2.1	− .1
60	2.8	3.3	.5	.1	4.1	2.4	2.2	− .4
70	3.0	3.8	.3	.1	4.2	2.1	2.5	−1.0
80	2.6	4.3	.8	−1.3	4.0	1.6	3.0	−1.1
90	2.8	4.2	1.4	2.1	3.3	3.9	1.3	− .8

falls to 3.3 kilograms and in the following year it is only 1.9 kilograms. The same type of contrast between heavy and light boys obtains as between tall and short ones. Between fourteen and sixteen the heavy boys are gaining more rapidly than the light ones, while between sixteen and eighteen the reverse is true. The belated gain in weight of light boys between sixteen and seventeen is particularly noticeable.

The same type of difference comes out in comparing the yearly rate of growth of school boys and working boys. Working boys, who are lighter, gain weight more rapidly between sixteen and seventeen than school boys. For school boys the period of rapid yearly gain in weight is over at sixteen, while for working boys it continues to seventeen.

The period of adult weight for boys is not shown in these tables.

The yearly differences in the five-percentile scales for weight among girls are found in Table 393. The yearly differences in the ten-percentile scales for school girls and working girls separately are shown in Table 394. As in the case of height, the tables for weight indicate that girls are much more nearly adult in weight at fourteen than boys. The amount of yearly gain is less and it ceases entirely at seventeen years. Between seventeen and eighteen there is even a slight falling off in weight. We can say, therefore, that seventeen marks an adult status in weight for girls.

There are some indications that working girls mature more slowly in weight than school girls. They gain more in weight after the age of fourteen than school girls. This is evident in the year fourteen to fifteen and in the year sixteen to seventeen. In year fifteen to sixteen the yearly gain is difficult to judge because of the addition of the new group of school girls at sixteen years.

Vital Capacity

The differences in vital capacity between the yearly five-percentile scales for the entire group of boys are presented in Table 395. The differences between the ten-percentile scales for working (M) and school (X) boys separately are given in Table 396. The gain in vital capacity is marked each year. From fourteen to sixteen it is about 400 cc. a year, from sixteen to seventeen 300 cc., and from seventeen to eighteen 150 cc. The greatest gain occurs between fifteen and sixteen. In the years fourteen to sixteen the gain in vital capacity is greatest in the upper half of the scale. In other words, boys whose vital capacity is above average make the most rapid gain during those years. In the year sixteen to seventeen the reverse is true. The boys of small vital capacity gain most rapidly. The course of events is similar to that in height and weight, though the three measures do not exactly correspond from year to year. In comparing working and school boys the same type of contrast is apparent. School boys gain more rapidly than working boys in vital capacity between

TABLE 395

VITAL CAPACITY: YEARLY DIFFERENCES IN CUBIC CENTIMETERS BETWEEN THE FIVE-PERCENTILE SCALES

Boys

Percentiles	15–14	16–15	17–16	18–17
5	284	277	319	208
10	240	324	307	191
15	232	449	312	176
20	224	380	290	160
25	240	394	295	142
30	253	409	314	116
35	285	406	333	115
40	314	396	326	138
45	355	399	317	148
50	376	416	305	156
55	392	428	301	157
60	402	425	316	156
65	402	420	320	180
70	399	422	318	224
75	408	426	297	245
80	406	437	306	222
85	409	462	297	206
90	387	509	273	192
95	323	472	221	225

TABLE 396

VITAL CAPACITY: YEARLY DIFFERENCES IN CUBIC CENTIMETERS BETWEEN THE TEN-PERCENTILE SCALES

Boys

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	224	390	238	267	20	474	382	199
20	252	476	254	258	167	367	370	164
30	288	452	241	382	207	361	383	123
40	405	462	260	326	233	360	442	123
50	448	442	316	284	295	342	447	137
60	478	415	302	362	342	366	431	146
70	486	408	342	346	343	392	420	193
80	337	426	473	159	307	407	437	230
90	295	441	367	243	325	479	373	231

TABLE 397

VITAL CAPACITY: YEARLY DIFFERENCES IN CUBIC CENTIMETERS BETWEEN THE FIVE-PERCENTILE SCALES

Girls

Percentiles	15–14	16–15	17–16	18–17
5	314	63	58	−94
10	248	78	25	−24
15	188	108	15	−13
20	162	94	66	−34
25	167	100	90	−38
30	163	114	85	−25
35	159	125	84	−18
40	156	133	84	− 9
45	152	142	83	− 4
50	162	137	81	− 4
55	172	131	78	− 3
60	183	125	75	− 2
65	192	115	80	− 4
70	203	102	96	− 9
75	214	107	94	−14
80	228	112	103	−32
85	209	115	68	9
90	189	173	115	−88
95	211	166	−12	47

TABLE 398

VITAL CAPACITY: YEARLY DIFFERENCES IN CUBIC CENTIMETERS BETWEEN THE TEN-PERCENTILE SCALES

Girls

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	147	99	76	−264	310	63	64	12
20	169	91	98	− 25	171	123	21	39
30	166	133	57	6	123	120	91	−17
40	171	167	28	29	114	137	103	1
50	186	154	54	36	102	147	116	5
60	200	139	86	79	116	127	115	7
70	218	127	116	86	142	110	105	5
80	219	111	167	63	168	102	190	−96
90	179	217	145	172	148	154	104	−89

fourteen and sixteen, while working boys gain more rapidly than school boys between sixteen and seventeen. The fact that school boys gain more than working boys between seventeen and eighteen suggests that they probably continue developing their vital capacity longer than the working group.

These tables do not show at what age vital capacity reaches an adult status in boys.

In the case of the girls, vital capacity, like height and weight, is far nearer an adult status at fourteen years than it is in the case of the boys (see Tables 397 and 398). The gain from year to year is smaller, and it ceases entirely at seventeen, when an adult status is reached as it is in height and weight. The median gain is in round numbers 160 cc. from fourteen to fifteen, 140 cc. from fifteen to sixteen, and 80 cc. from sixteen to seventeen. There is no such marked difference between the upper and lower half of the scale as in the case of the boys. The tables show a somewhat more rapid gain for school girls between fourteen and fifteen and for working girls between sixteen and seventeen, which is in accord with the general finding that working children constitute a group of slower development than school children.

Strength of the Hand

The differences between the five-percentile scales of strength of the hand for boys, for right and left hand separately, are given in Table 399. The differences between the ten-percentile scales for school boys (X) and working boys (M) separately, right and left hand, are given in Table 400.

The gain in strength of the hand is steady from year to year. The median gain for the right hand is about 5.0 kilograms from fourteen to fifteen, 6.5 kilograms from fifteen to sixteen, 7.0 kilograms from sixteen to seventeen, and 2.0 kilograms from seventeen to eighteen. For the left hand, the corresponding median gains are about 5.0 kilograms from fourteen to fifteen, 5.5 kilograms from fifteen to sixteen, 6 kilograms from sixteen to seventeen, and 3.0 kilograms from seventeen to eighteen. This is the first of the physical measures in which the year of greatest gain has been as late as sixteen to seventeen.

The same type of difference in the development of inferior and superior boys appears in this measure as in height, weight, and vital capacity. Between fourteen and sixteen the gain is greater in the upper than in the lower half of the scale. In other words, strong boys in those two years make larger gains than weak ones. In the years sixteen to eighteen, the reverse is true. The weak boys make greater gains than the strong ones.

The same type of difference is evident in comparing the working (M) and school (X) groups. School boys, who are stronger than working boys, gain most rapidly between fourteen and sixteen, while working boys gain

TABLE 399

STRENGTH OF THE HAND: YEARLY DIFFERENCES IN KILOGRAMS BETWEEN THE FIVE-PERCENTILE SCALES

Boys

PERCENTILES	RIGHT HAND				LEFT HAND			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
5	4.1	3.1	6.5	3.2	3.0	2.6	6.1	2.5
10	4.1	3.7	6.8	4.1	3.6	3.4	5.5	3.2
15	4.0	4.7	6.7	3.9	3.6	4.1	3.7	2.8
20	3.9	5.0	7.3	3.0	3.7	4.4	6.1	2.6
25	4.0	5.1	7.6	2.5	3.6	4.7	6.3	2.4
30	4.2	5.5	7.5	2.3	3.6	4.9	6.3	2.4
35	4.3	4.8	8.1	2.7	3.9	4.9	6.3	2.6
40	4.3	6.1	7.1	2.5	4.3	5.0	6.1	2.9
45	4.4	6.3	7.1	2.3	4.5	5.7	5.5	2.9
50	4.7	6.5	6.8	2.1	4.7	5.3	6.1	2.9
55	5.3	6.4	6.7	1.7	5.1	5.0	6.4	2.6
60	6.1	6.1	6.6	1.5	5.6	4.9	6.2	2.4
65	6.8	5.9	6.6	1.3	6.0	4.8	6.1	2.2
70	7.1	5.9	6.5	1.3	6.5	4.8	5.7	2.0
75	8.0	5.7	6.2	1.0	6.7	5.1	5.6	1.7
80	8.3	5.7	5.9	.7	6.9	5.4	5.4	1.5
85	8.7	5.4	5.6	1.0	7.2	5.7	5.1	1.2
90	8.5	5.3	4.8	1.1	7.5	5.9	4.4	1.3
95	7.8	6.4	3.8	1.9	6.1	5.6	5.2	1.2

TABLE 400

STRENGTH OF THE HAND: YEARLY DIFFERENCES IN KILOGRAMS BETWEEN THE TEN-PERCENTILE SCALES

Boys

RIGHT HAND

PERCENTILES	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	4.2	5.2	6.7	4.6	4.0	3.5	5.1	5.4
20	4.7	6.1	6.4	3.9	4.6	4.5	6.0	5.4
30	5.0	7.1	5.7	3 2	4.0	4.9	8.3	3.0
40	5.8	6.7	6.0	2.7	3.9	5.4	8.3	3.1
50	6.9	6.2	5.9	3.6	4.0	6.0	8.0	2.8
60	8.5	5.2	6.4	3.1	4.2	6.1	8.1	2.7
70	9.6	4.7	6.2	2.4	5.4	6.1	8.2	1.8
80	10.3	4.2	6.8	2.2	6.8	6.1	7.4	1.8
90	8.4	7.8	4.7	1.6	7.4	6.9	5.9	1.6

TABLE 400—*Continued*

Left Hand

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	4.7	4.6	5.7	2.4	2.8	2.8	6.7	3.2
20	4.0	5.5	5.1	2.7	3.3	3.9	5.8	4.1
30	3.0	5.9	4.9	3.7	3.3	4.4	7.3	2.8
40	5.5	5.4	5.5	3.4	3.5	4.6	7.1	3.2
50	6.1	5.4	5.5	2.8	3.9	4.6	7.1	3.5
60	7.1	6.4	5.1	3.6	4.2	5.2	7.1	3.0
70	7.5	5.6	4.9	3.5	5.2	4.7	7.0	2.7
80	8.2	5.7	4.0	3.2	6.1	4.2	7.3	1.9
90	7.7	5.3	4.9	2.6	6.9	5.2	6.9	1.3

TABLE 401

STRENGTH OF THE HAND: YEARLY DIFFERENCES IN KILOGRAMS BETWEEN THE FIVE-PERCENTILE SCALES

Girls

Percentiles	Right Hand				Left Hand			
	15–14	16–15	17–16	18-17	15–14	16–15	17–16	18–17
5	3.6	1.3	2.2	.3	2.4	1.5	1.3	–.7
10	3.0	1.0	2.5	–.2	2.4	1.3	1.4	–.3
15	3.4	.6	2.5	–.3	2.2	1.0	1.6	–.2
20	3.4	.7	2.5	–.3	2.4	1.1	1.5	0
25	3.5	.7	2.3	–.3	2.5	.7	1.9	–.1
30	3 5	.8	2.3	–.5	2.4	.6	2.0	–.1
35	3.4	1.0	2.1	–.5	2.4	.6	2.1	–.3
40	3 3	1.0	2 0	–.4	2.4	.6	2.2	–.2
45	3.0	1.0	1.9	–.3	2.5	.6	2.2	–.1
50	2.8	1.0	1.8	–.3	2.4	.6	2.2	–.1
55	2.8	1.0	1.6	–.1	2.3	.8	2.1	–.1
60	2 9	.9	1.6	–.1	2.2	.9	1.9	1.1
65	2.9	.8	1.7	0	2.2	1.0	1.7	0
70	2 9	.8	1.6	.1	2.2	1.1	1.5	–.2
75	2.6	.8	1.6	.3	2.2	1.1	1.5	–.1
80	2.5	.8	1.9	.4	2.2	1.2	1.4	–.1
85	2.0	1.1	2 3	.4	1.9	1.4	1.3	–.1
90	2.4	1.3	2.7	–.2	1.4	1.7	1.5	.2
95	1.8	2.7	3.1	–.5	2.3	.8	2.2	.1

more rapidly than school boys between sixteen and seventeen. After seventeen the gain is approximately the same for the two groups.

These tables do not show at what age an adult status in strength of the hand is reached by boys.

As in the other physical measures, girls are nearer an adult status at fourteen than boys. The differences from year to year (see Tables 401 and 402) are much less and no improvement occurs after seventeen. The median gain from year to year for the right hand is in round numbers 3.0 kilograms from fourteen to fifteen, 1.0 kilogram from fifteen to sixteen, 1.5 kilograms from sixteen to seventeen, and no gain—indeed a slight loss—from seventeen to eighteen. The year fourteen to fifteen shows a tendency to greater gain in the lower than in the upper half of the scale, suggesting that this year is one of belated development for those of inferior capacity in strength. No differences in the rate of gain between working girls and school girls are apparent except the more rapid gain of the working girls between sixteen and seventeen.

TABLE 402 — STRENGTH OF THE HAND: YEARLY DIFFERENCES IN KILOGRAMS BETWEEN THE TEN-PERCENTILE SCALES

Girls

RIGHT HAND

PERCENTILES	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	3.4	1.8	1.1	.4	4.0	.8	3.1	−.2
20	3.6	1.2	1.3	.7	3.5	.3	3.3	−.5
30	3.2	1.5	1.2	.6	3.2	.9	2.9	−.5
40	3.1	1.5	1.2	.5	3.2	1.0	2.9	−.9
50	3.2	1.2	1.4	.7	3.2	1.1	2.4	−.6
60	3.2	1.0	1.8	.9	2.3	1.0	2.2	−.4
70	2.9	1.0	2.0	1.2	2.2	1.0	2.0	−.1
80	2.9	.6	2.9	.6	2.0	1.0	1.8	0
90	3.5	1.1	2.9	.2	1.4	1.3	2.1	.2

LEFT HAND

PERCENTILES	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	2.7	1.5	.3	−.9	2.4	1.4	.8	−.8
20	3.0	.7	.9	.6	1.9	.1	2.9	−.8
30	2.7	.9	1.2	.7	1.7	1.1	2.9	−.7
40	2.5	.9	1.6	.9	1.9	.8	3.1	−.9
50	2.4	1.0	1.6	.5	2.3	.7	2.5	−.3
60	2.5	1.1	1.2	.4	2.1	.8	2.4	−.3
70	2.4	1.4	.6	.6	1.9	.9	3.1	−1.1
80	2.3	1.5	.7	.5	1.9	1.4	1.9	−.3
90	2.8	−.7	1.4	.8	.5	1.9	2.0	−.3

STEADINESS OF THE HAND

The differences between the yearly five-percentile scales in steadiness for boys, right and left hand, are presented in Table 403. The differences between the ten-percentile scales for school boys (X) and working boys (M) separately, right and left hands, are given in Table 404.

Steadiness, like the other physical measures of boys, continues to develop from year to year up to eighteen. The development is greatest for the right hand between fourteen and sixteen and less between sixteen and eighteen. For the left hand, the gain is greatest of all in the year sixteen to seventeen. Steadiness also shows the tendency for the superior boys to gain more rapidly in the younger years. In the case of the right hand, the gain between fourteen and fifteen is greatest in the upper half of the scale. In the years fifteen to eighteen, the reverse is true. In the case of the left hand, whose development appears to be slower than the right, the gain is greatest in the upper half of the scale between fourteen and sixteen, but greatest in the lower half between sixteen and eighteen. In other words, the steadiest boys make their most rapid gains between fourteen and fifteen with the right hand and between fourteen and sixteen with the left. The unsteady boys gain more rapidly than the steady ones between fifteen and eighteen with the right hand, and between sixteen and eighteen with the left.

The relation between school boys and working boys in steadiness is quite different from that of the other physical measures. The school boys reach an equilibrium in steadiness at sixteen. Between sixteen and eighteen there is practically no gain. This is true of both right and left hand. The working boys continue to improve up to eighteen years. The year between sixteen and seventeen, which is one of no gain for the school boys, is one of rapid gain for working boys. The years of rapid gain for school boys are from fourteen to sixteen, and for working boys from fifteen to seventeen.

The girls, like the boys, keep on gaining slowly in steadiness up to eighteen years (see Tables 405 and 406). The only year of rapid gain is that between fourteen and fifteen. The more rapid gain of the steadier girls between fourteen and fifteen is striking, but it is not—as in most other measures—compensated by a more rapid gain of the unsteady girls later on.

The girls show the same type of contrast between the school group and the working group as the boys, except that the difference is evident a year earlier. The school girls show little improvement in steadiness after the age of fifteen, while the working girls go on improving up to eighteen. For the school girls the year of rapid gain is from fourteen to fifteen, while for the working girls it is from fifteen to seventeen.

TABLE 403

STEADINESS OF THE HAND: YEARLY DIFFERENCES IN NUMBER OF CONTACTS BETWEEN THE FIVE-PERCENTILE SCALES

Boys

Percentiles	Right Hand				Left Hand			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
5	6	19	7	11	7	4	5	10
10	7	6	4	10	7	1	12	3
15	8	17	10	4	6	0	11	5
20	8	20	8	8	6	−1	11	10
25	7	9	12	3	6	4	6	9
30	7	9	11	4	7	3	11	4
35	7	10	9	5	8	2	12	4
40	7	2	4	10	8	1	12	10
45	7	14	4	10	8	1	12	10
50	8	13	5	8	8	6	25	3
55	10	11	10	4	8	6	13	4
60	11	10	9	4	7	6	13	3
65	13	12	6	8	7	6	12	9
70	12	12	17	10	7	12	6	9
75	12	11	8	4	10	9	10	5
80	13	9	8	4	12	8	10	4
85	14	12	3	2	17	5	9	7
90	15	8	1	8	18	7	5	8
95	12	7	−1	4	17	8	1	3

TABLE 404

STEADINESS OF THE HAND: YEARLY DIFFERENCES IN NUMBER OF CONTACTS BETWEEN THE TEN-PERCENTILE SCALES

Boys

Right Hand

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	14	17	−3	5	3	10	15	3
20	11	6	−1	0	7	8	16	8
30	13	11	−2	−5	9	11	17	3
40	15	9	0	0	4	13	16	9
50	16	18	−1	3	4	20	16	2
60	15	10	−8	8	7	19	14	6
70	21	17	−2	2	9	18	19	4
80	16	10	−9	0	6	26	11	2
90	21	14	−6	−2	10	25	5	9

TABLE 404—*Continued*

LEFT HAND

PERCENTILES	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	11	11	−3	4	7	4	14	3
20	11	5	−1	3	2	11	7	9
30	11	19	−2	5	3	11	13	3
40	9	10	0	−1	6	8	14	10
50	10	7	0	−1	8	7	20	3
60	13	11	0	−7	6	13	15	9
70	8	17	0	−2	3	14	15	9
80	16	10	0	−7	4	20	13	1
90	17	12	−12	0	9	24	13	3

TABLE 405

STEADINESS OF THE HAND: YEARLY DIFFERENCES IN NUMBER OF CONTACTS BETWEEN THE FIVE-PERCENTILE SCALES

Girls

PERCENTILES	RIGHT HAND				LEFT HAND			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
5	8	4	1	4	10	0	1	3
10	10	2	1	7	6	2	7	1
15	8	4	5	3	6	5	1	1
20	8	6	2	5	8	2	2	1
25	7	5	3	10	9	1	2	1
30	8	4	5	7	9	0	2	6
35	9	3	9	3	8	1	6	2
40	10	1	9	4	8	1	6	3
45	11	5	4	5	8	4	3	2
50	11	5	3	9	8	4	2	3
55	12	4	5	6	8	4	2	8
60	14	1	9	3	10	2	9	3
65	14	3	6	3	11	7	3	3
70	14	4	4	5	12	6	3	9
75	16	3	3	7	13	6	6	6
80	16	0	8	3	14	3	9	4
85	17	4	2	2	14	6	4	9
90	19	2	2	6	16	2	12	3
95	17	5	1	1	22	2	5	6

TABLE 406

STEADINESS OF THE HAND: YEARLY DIFFERENCES IN NUMBER OF CONTACTS BETWEEN THE TEN-PERCENTILE SCALES

Girls

RIGHT HAND

PERCENTILES	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	10	0	0	5	12	4	3	7
20	14	−3	1	3	9	11	4	8
30	14	−3	2	6	5	11	13	2
40	14	−7	6	3	7	11	12	7
50	15	−2	1	2	9	14	12	3
60	22	−9	1	3	10	15	11	4
70	17	−4	0	3	9	18	5	9
80	25	−3	−5	−3	11	16	11	2
90	24	2	−8	−3	9	20	10	1

LEFT HAND

PERCENTILES	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	5	−2	0	7	8	10	3	1
20	11	0	−1	1	6	8	6	0
30	8	1	−2	1	9	4	11	2
40	6	6	−7	1	9	4	12	1
50	13	1	−3	−2	6	10	13	1
60	13	1	−2	−1	5	12	12	2
70	15	2	−4	−5	10	15	4	11
80	16	7	−7	2	10	15	14	8
90	26	1	−10	0	8	15	16	0

RAPIDITY OF MOVEMENT OF THE HAND

Rapidity of movement is recorded in terms of the number of taps in the first 30 seconds and the number of taps in the entire minute, for right and left hands. The yearly differences for the entire group of boys, in the 30-second measure, right and left hands, are given in Table 407, and for the 60-second measure in Table 408. The tables show steady gain with the right hand up to eighteen and with the left hand up to seventeen. The same is in general true of both intervals. For both hands the years fourteen to sixteen are periods of rapid gain. The gain is about six taps for the 30-second interval and about twelve taps for the 60-second interval with the right hand, showing that the gain is distributed equally between the first and second half-minutes of the test. With the left hand the same holds true, except that the gain is greater between fifteen and sixteen than between fourteen and fifteen. For both hands the year sixteen to seventeen is a year of small gain, less than half that of the previous years. It is also true that what gain there is is much more evident in the 60- than in the 30-second interval, showing that it is to be attributed to the second rather than to the first half of the minute test. In the year seventeen to eighteen, this tendency is still more marked in the right hand. That year shows a marked gain of speed for the right hand (a median of twelve taps) which is due largely to the second half-minute, since it is not at all proportionately represented in the first half-minute. The left hand shows no such tendency. There is gain in the lower half of the scale, but loss in the upper half. The significant fact, therefore, is the decided gain in endurance with the right hand, between seventeen and eighteen.

The yearly differences for school boys (X) and working boys (M) separately, figured from the ten-percentile scales, are given in Tables 409

TABLE 407

RAPIDITY OF MOVEMENT OF THE HAND: YEARLY DIFFERENCES IN NUMBER OF TAPS IN 30 SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Boys

Percentiles	Right Hand				Left Hand			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
5	5	6	2	5	7	5	−1	4
10	7	5	0	4	7	5	−1	4
15	6	5	1	3	5	6	0	4
20	6	6	1	2	5	7	1	2
25	5	6	1	2	6	6	1	2
30	5	6	1	2	6	5	2	2
35	5	6	1	2	5	6	2	1
40	6	6	1	2	5	7	1	1
45	5	6	1	2	5	6	2	1
50	6	6	1	2	5	7	2	0
55	6	6	2	1	5	6	2	1
60	6	6	2	0	5	6	2	0
65	6	9	−1	0	4	8	2	0
70	7	6	1	1	5	7	3	−1
75	7	7	1	1	5	7	4	−1
80	7	7	1	1	5	9	2	0
85	8	6	2	0	4	10	2	0
90	8	8	1	−1	6	11	1	0
95	8	10	2	−3	6	13	1	−3

and 410. The course of events does not differ markedly between school boys and working boys. So far as the right hand is concerned, the chief difference between the two groups is brought out by comparing the corresponding 30- and 60-second records. In the year fourteen to fifteen, the school boys gain somewhat more than the working boys in the 60-second interval but only about the same amount in the 30-second interval, showing that their gain is to be attributed to increased endurance in the second half of the test. Between fifteen and sixteen, the gain for the whole minute is of about the same order for the two groups, but it is less for the school than the working group in the first half-minute, showing again that the school boys increased their total speed by their ability to maintain the pace better in the second half of the test. In the years from sixteen to eighteen, the chief differences are that working boys gain most from sixteen to seventeen and school boys gain most from seventeen to eighteen. The tables also show an increase in endurance with the left hand among working boys.

TABLE 408

RAPIDITY OF MOVEMENT OF THE HAND: YEARLY DIFFERENCES IN NUMBER OF TAPS IN 60 SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Boys

Percentiles	Right Hand				Left Hand			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
5	13	12	5	19	8	4	1	6
10	12	10	3	17	12	10	4	7
15	12	10	5	14	12	12	4	8
20	8	12	4	14	12	11	5	6
25	9	12	4	14	12	11	5	5
30	9	13	4	13	11	11	6	3
35	10	13	3	13	10	12	5	3
40	12	12	3	13	10	13	5	2
45	12	12	3	12	9	14	5	1
50	13	11	4	12	10	14	6	−1
55	13	11	5	12	10	15	6	−1
60	14	12	4	12	11	15	7	−2
65	12	14	4	10	10	16	8	−3
70	13	13	5	9	10	17	8	−3
75	14	14	6	8	12	16	8	−4
80	13	16	6	10	12	18	6	−4
85	12	15	10	9	8	20	8	−5
90	14	17	9	8	10	21	6	−5
95	18	21	11	7	8	25	1	0

The left-hand records show the same gain in endurance for school boys between fourteen and sixteen. The working boys also show gain in endurance with the left hand between fifteen and seventeen. The working boys show greater gains in left-hand speed between sixteen and eighteen than the school boys.

These records do not show at what age an adult capacity in speed is reached for either group.

The yearly differences for the whole group of girls in the 30-second interval and in the 60-second interval are shown in Tables 411 and 412. There is a steady gain in speed with both hands up to eighteen years. A comparison of the 30- and 60- second intervals shows that in the right

TABLE 409

RAPIDITY OF MOVEMENT OF THE HAND: YEARLY DIFFERENCES IN NUMBER OF TAPS IN 30 SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Boys

Right Hand

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	5	4	−2	8	7	8	3	3
20	5	6	−1	6	9	5	4	3
30	6	5	0	6	8	5	4	3
40	7	3	3	3	8	6	3	4
50	8	2	4	2	7	4	5	3
60	8	4	3	1	7	1	8	3
70	7	5	2	3	7	8	2	3
80	9	3	2	2	7	8	3	4
90	9	7	3	−3	12	7	7	1

Left Hand

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	7	3	−3	12	7	7	0	4
20	7	4	1	5	7	6	3	2
30	5	5	3	2	7	5	3	3
40	5	6	1	3	7	5	3	2
50	6	6	2	2	7	5	4	2
60	6	6	3	1	7	5	5	1
70	7	5	3	3	5	7	4	1
80	7	7	0	5	5	8	5	1
90	6	11	−1	0	3	12	7	0

hand the gain is about the same in amount in the first and second half-minutes from fourteen to fifteen, since the 60-second difference is about twice the 30-second difference. Between fifteen and sixteen the gain is due more to the first than to the second half-minute, showing poor endurance. Between sixteen and eighteen far more of the gain is to be attributed to the second than to the first half-minute. For the girls, therefore, the increased endurance, or capacity to maintain the initial speed, occurs between sixteen and eighteen with the right hand. In the left hand there is a steady gain in endurance as well as in speed, with the possible exception of year fifteen to sixteen.

TABLE 410

RAPIDITY OF MOVEMENT OF THE HAND: YEARLY DIFFERENCES IN NUMBER OF TAPS IN 60 SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Boys

Right Hand

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	1	8	2	13	14	15	7	7
20	11	16	0	9	13	12	8	6
30	14	12	1	13	11	13	6	6
40	15	10	4	7	12	13	7	5
50	16	11	6	1	13	13	7	3
60	16	13	6	6	14	13	6	6
70	16	14	7	8	14	14	7	4
80	15	14	10	7	14	14	10	3
90	20	13	19	6	15	20	12	3

Left Hand

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	14	10	2	5	5	18	7	7
20	14	11	3	7	13	12	7	8
30	11	13	5	2	14	9	9	6
40	12	15	5	1	12	11	8	5
50	13	14	8	0	10	13	8	3
60	15	14	8	−1	10	13	10	2
70	18	14	6	0	9	15	11	1
80	16	18	3	3	8	16	13	−6
90	12	24	1	8	5	20	16	−4

Tables 413 and 414 show the yearly differences for school girls (X) and working girls (M) separately. In the right-hand records there is proof that, on the whole, the school girls gain more in endurance than working girls. More of their total gain in the 60 seconds is to be attributed to the second than to the first half of the test in years fourteen to seventeen. For the working girls increased endurance shows somewhat in years sixteen to eighteen.

The left-hand records for working and school girls show few significant differences. For both groups there is a steady yearly gain, which is proportionately greater for the 60- than for the 30-second interval, showing that the gain is to be attributed to increased endurance in maintaining speed. The increase in left-hand endurance is more marked among working than among school girls. This is in accord with the records of working boys and is probably due to the relatively superior left-hand capacity of working children.

TABLE 411

RAPIDITY OF MOVEMENT OF THE HAND: YEARLY DIFFERENCES IN NUMBER OF TAPS IN 30 SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Girls

Percentiles	Right Hand				Left Hand			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
5	4	6	2	−1	3	6	4	−1
10	4	7	0	0	2	7	2	0
15	5	4	1	2	4	4	2	1
20	3	5	2	2	4	4	3	2
25	3	5	1	2	4	4	3	1
30	3	5	2	1	3	5	2	1
35	3	4	2	3	4	4	2	2
40	3	4	2	1	3	5	1	2
45	3	4	3	0	4	4	1	2
50	3	4	3	0	3	5	0	2
55	3	4	3	0	3	5	1	1
60	3	5	2	−2	4	4	1	1
65	3	6	1	−1	3	4	1	1
70	3	5	1	−1	2	4	2	1
75	3	6	1	−2	3	4	2	1
80	4	5	1	−1	3	4	3	0
85	5	3	1	0	3	4	3	0
90	4	3	2	2	3	4	2	2
95	4	5	1	5	2	5	2	4

TABLE 412

RAPIDITY OF MOVEMENT OF THE HAND: YEARLY DIFFERENCES IN NUMBER OF TAPS IN 60 SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Girls

Percentiles	Right Hand				Left Hand			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
5	4	12	8	11	10	9	9	2
10	8	11	4	14	11	6	7	1
15	10	9	4	15	9	5	11	−2
20	7	12	3	15	8	16	9	1
25	8	11	3	15	10	6	7	4
30	8	10	5	14	10	6	7	4
35	9	8	6	13	9	8	6	3
40	8	8	7	11	9	9	5	3
45	8	7	8	11	9	10	4	3
50	8	6	9	11	9	10	3	4
55	7	7	8	10	9	10	3	4
60	7	6	8	9	9	8	4	4
65	7	6	8	4	9	7	5	3
70	7	5	9	5	8	8	5	2
75	7	5	9	5	8	8	5	1
80	7	6	7	7	9	8	5	0
85	9	4	8	8	8	6	6	2
90	8	3	11	11	6	10	7	0
95	10	3	14	20	4	11	7	4

TABLE 413

RAPIDITY OF MOVEMENT OF THE HAND: YEARLY DIFFERENCES IN NUMBER OF TAPS IN 30 SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Girls

Right Hand

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	6	0	2	7	5	8	2	−1
20	4	2	3	5	5	6	2	1
30	2	1	5	3	4	5	2	2
40	3	2	4	2	4	5	2	2
50	4	1	5	0	5	5	2	1
60	3	2	4	−1	4	5	4	0
70	3	2	4	1	3	8	1	0
80	3	2	2	5	5	8	1	−1
90	5	0	1	10	7	5	4	−2

TABLE 413—*Continued*

Left Hand

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	−3	10	2	−2	4	5	5	0
20	4	3	2	2	5	3	5	1
30	4	2	2	4	5	4	4	1
40	4	3	1	3	4	4	3	3
50	4	4	0	3	3	5	2	3
60	5	3	1	3	3	5	2	2
70	4	4	2	2	3	4	2	2
80	4	3	3	2	3	3	4	1
90	5	4	2	2	2	2	5	2

TABLE 414

RAPIDITY OF MOVEMENT OF THE HAND: YEARLY DIFFERENCES IN NUMBER OF TAPS IN 60 SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Girls

Right Hand

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	10	5	2	14	5	7	−4	12
20	10	7	4	7	10	13	6	3
30	11	3	9	−1	8	14	5	4
40	10	3	10	1	9	12	6	4
50	10	8	11	−2	10	10	7	4
60	10	3	11	−5	9	10	12	−2
70	9	3	10	0	6	12	8	−2
80	10	1	11	0	7	10	8	−2
90	12	7	9	17	10	10	5	3

Left Hand

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	11	4	10	−8	9	10	6	6
20	10	5	7	6	8	6	11	2
30	10	7	5	7	9	7	9	4
40	10	9	3	6	10	8	8	4
50	11	8	3	6	9	10	6	4
60	11	9	3	4	7	9	6	5
70	11	8	4	3	9	7	7	4
80	12	6	6	3	6	7	9	1
90	12	8	7	−5	4	6	13	3

CARD–SORTING

The yearly differences in card-sorting, measured by time and by index, are given for the entire group of boys in Table 415, and for working and school boys separately in Table 416. There is a steady yearly gain up to seventeen, which is progressively less from year to year. The difference is so slight between seventeen and eighteen as to indicate a standstill. It seems probable, therefore, that an adult status has been reached at eighteen.

School and working boys show no different trends. The only difference is a somewhat more rapid rate of gain for working boys up to sixteen years. There is a tendency evident each year for the gains to be greater among inferior than among superior boys.

The yearly differences between the percentile scales for the entire group of girls in card-sorting, time and index, are shown in Table 417. The differences for school girls and working girls separately are shown in Table 418. The girls keep on gaining up to eighteen years. However, the gain from sixteen on is so slight that it is fair to say that an adult capacity has been approximately reached at sixteen years. The gains are successively less from year to year.

A comparison of working and school girls shows that the chief difference between them is a somewhat more rapid rate of gain on the part of the working girls between fourteen and fifteen in both time and index. Between fifteen and sixteen, the working girls gain more in time but less in index than the school girls, showing that they sacrificed speed somewhat to accuracy. Above sixteen the yearly gains are small, and interpretations of difference between the two groups doubtful. Among girls, also, differences are greater among inferior than among superior girls.

TABLE 415

CARD-SORTING: YEARLY DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Boys

Percentiles	Time				Index			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
5	5.5	3.7	3.8	−3.4	6.3	3.7	1.4	−1.8
10	4.6	3.5	2.7	−.8	5.7	2.7	2.9	− .5
15	3.8	3.5	3.1	−.8	4.8	3.3	2.0	.2
20	4.1	3.3	2.6	−.4	4.2	3.5	1.6	.9
25	3.8	3.8	1.9	−.4	4.3	3.9	1.1	.6
30	3.6	3.5	2.1	−.5	4.1	4.1	0.4	1.0
35	3.5	3.2	2.3	−.7	4.0	3.8	0.9	.9
40	3.5	3.0	2.3	−.6	4.0	3.4	1.1	.7
45	3.4	2.9	2.1	−.4	4.0	3.1	1.3	.7
50	3.3	2.9	1.9	−.4	3.8	2.9	1.4	.6
55	3.0	2.9	1.8	−.3	3.6	2.7	1.4	.6
60	2.9	2.8	1.7	−.3	3.4	2.7	1.2	.7
65	2.9	2.7	1.6	−.2	3.1	2.8	0.9	.6
70	2.3	2.6	1.5	−.2	3.1	2.9	0.6	.6
75	3.0	2.3	1.4	−.1	3.2	2.9	0.2	.7
80	3.2	1.9	1.7	−.1	3.4	2.7	0.0	.7
85	3.2	1.8	1.8	.1	3.5	2.9	−0.4	1.9
90	2.3	2.6	1.0	.2	2.9	3.2	−0.2	1.4
95	2.9	1.9	.2	.4	2.6	2.5	0	.8

TABLE 416

CARD-SORTING: YEARLY DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Boys

TIME

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	4.8	2.6	1.7	0.0	5.9	2.5	2.9	.0
20	4.0	2.7	1.0	1.6	4.8	3.3	2.0	1.6
30	4.0	1.9	1.6	1.1	4.5	3.2	1.9	1.1
40	3.5	1.9	1.4	1.3	4.1	3.6	1.4	1.3
50	3.5	1.7	1.1	1.4	3.8	3.5	1.3	1.4
60	3.5	1.5	1.0	1.2	3.6	3.4	1.1	1.2
70	3.6	1.4	.8	1.2	3.2	3.5	.9	1.2
80	4.1	.6	1.0	1.2	2.5	3.5	.7	1.2
90	2.8	1.8	4	1.4	3.4	2.3	.8	1.4

TABLE 416—*Continued*

INDEX

PERCENTILES	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	4.9	3.3	1.1	2.6	6.5	3.0	2.8	0
20	4.5	3.4	1.6	2.0	5.4	3.3	2.0	1.4
30	4.5	2.6	1.6	2.2	4.6	3.3	1.5	1.6
40	4.5	2.2	1.6	1.6	4.6	3.7	1.0	1.5
50	4.2	1.9	1.0	1.6	4.3	3.5	1.2	1.4
60	4.2	1.5	.7	2.6	3.9	3.2	1.5	1.1
70	4.0	1.2	.9	1.7	3.3	3.3	1.1	1.1
80	3.6	1.2	1.0	2.2	2.7	4.1	.1	1.1
90	2.4	1.4	.3	3.5	3.5	4.0	−.8	1.7

TABLE 417

CARD-SORTING: YEARLY DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Girls

PERCENTILES	TIME				INDEX			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
5	4.9	4.8	−.2	.6	3.9	5.1	−.5	.6
10	4.1	4.0	.2	.1	3.9	4.0	.0	.9
15	3.3	3.4	.4	.0	3.0	4.2	−.3	.5
20	3.7	2.8	.7	.0	3.7	3.0	.4	.4
25	3.4	2.9	1.0	−.1	3.9	2.4	1.0	.4
30	3.1	3.1	.5	.1	3.7	2.2	1.5	.2
35	2.8	2.8	.6	.2	3.4	2.2	1.2	.3
40	3.0	2.5	.7	.2	3.1	2.1	1.1	.4
45	3.1	2.2	.8	.3	3.3	1.9	1.1	.5
50	3.3	2.0	.8	.3	3.4	1.7	1.0	.6
55	3.2	1.9	.8	.5	3.4	1.6	1.0	.7
60	3.2	1.8	.9	.6	3.5	1.3	1.2	.7
65	3.3	1.5	1.0	.6	3.5	1.1	1.3	.8
70	3.1	1.4	1.2	.6	3.5	.9	1.4	1.0
75	2.9	1.5	1.0	.6	3.3	.8	1.6	1.0
80	2.8	1.6	.8	.6	2.9	.8	1.6	.9
85	3.0	1.3	.5	.6	3.0	.4	1.6	.4
90	3.2	1.0	.3	.6	3.4	.1	1.2	.8
95	3.0	.7	.0	2.2	2.7	.3	.4	2.2

TABLE 418

CARD-SORTING: YEARLY DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Girls

Time

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	3.3	3.5	1.2	−.2	5.0	4.1	.0	.4
20	3.0	2.6	1.6	−.3	3.9	3.0	.5	.5
30	2.5	2.6	.9	.9	4.0	2.9	1.0	.3
40	2.8	2.0	.9	2.1	3.7	2.7	.9	−.2
50	2.8	1.7	1.0	1.8	3.7	2.2	1.0	.2
60	3.0	1.3	1.0	1.6	3.6	1.9	1.2	.2
70	3.0	1.1	.9	.3	2.8	1.6	1.4	.3
80	3.1	.9	.7	1.0	3.3	1.7	1.4	.5
90	2.6	.8	.4	1.5	3.1	1.8	.6	.6

Index

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	3.1	4.8	.5	−.5	3.4	4.4	−.8	2.1
20	2.8	3.0	1.3	−.3	4.5	3.3	−.3	1.2
30	1.9	2.7	1.2	.1	4.7	1.9	1.0	1.2
40	2.4	2.5	.6	.6	4.5	1.9	1.3	.7
50	2.7	2.0	.6	1.0	4.2	1.5	1.4	.7
60	2.9	1.4	.7	1.3	4.4	1.0	1.7	.7
70	2.7	1.0	1.0	1.3	4.3	.7	1.8	1.0
80	2.8	.4	1.2	1.1	4.3	.5	2.2	.9
90	3.1	−.2	1.0	1.7	3.8	.4	1.7	.8

YEARLY GAINS IN MENTAL TESTS

The process of tracing the rate of growth in mental capacities is hampered by the fact that mental tests could not be repeated in exactly the same form from year to year, as could physical tests, without danger of practice effects that would effectually obscure results. Physical skills, too, may have been somewhat modified by familiarity, but in their case ideas played a comparatively small part in the outcome and actual motor skills a large part. In mental tests, the reverse was true in most instances. Some types of tests—the ingenuity tests and various kinds of association tests—could not be repeated without a change of content. Even so slight a change in a mechanical type of test as a change in the letter to be cancelled modified the results from year to year so profoundly as to vitiate yearly comparisons.

The tests furnishing the most satisfactory basis for yearly comparisons are the memory and substitution tests. The series of digits used in the memory test were changed from year to year, and also the keys of the substitution test, but differences in order of digits, so long as the obvious rules of constructing such series without sequences were adhered to, proved to have no bearing on the outcome. In discussing growth from year to year, the tests will be considered in the order of the previous chapters in so far as they furnish any evidence on the point at issue.

Cancellation

Although the cancellation test was given every year, the change in the letter to be cancelled proved to be so large a factor in the result that no direct yearly comparisons can be made. After discovering the importance of the letter as one element in the test, we decided to use the letter *a* again at seventeen and the letter *m* again at eighteen. It then becomes possible to compare directly year fourteen with year seventeen, and year fifteen with year eighteen. Table 419 presents the comparison in terms of index

TABLE 419

CANCELLATION — INDEX: AGE DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Boys

Percentiles	17–14 yrs. Letter *a*	18–15 yrs. Letter *m*
5	99.8	38.5
10	70.8	35.9
15	60.7	32.9
20	53.5	32.8
25	51.3	31.2
30	49.4	31.1
35	46.9	31.4
40	42.9	26.9
45	40.1	25.9
50	37.4	24.9
55	35.5	23.7
60	33.2	22.3
65	31.0	21.0
70	28.8	19.8
75	26.7	18.6
80	25.5	16.8
85	22.7	16.3
90	20.0	15.9
95	18.4	12.2

TABLE 420

CANCELLATION — INDEX: AGE DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Boys

Percentiles	X		M	
	17–14 yrs. Letter *a*	18–15 yrs. Letter *m*	17–14 yrs. Letter *a*	18–15 yrs. Letter *m*
10	66.0	23.4	78.9	48.3
20	64.4	29.8	54.2	43.0
30	56.9	27.3	45.5	41.5
40	48.6	24.8	40.0	38.8
50	42.8	22.4	33.3	34.7
60	32.7	20.3	29.9	32.3
70	29.8	17.9	28.0	30.0
80	24.8	15.6	25.4	26.6
90	20.3	10.6	20.0	25.7

TABLE 421

CANCELLATION — ACCURACY: AGE DIFFERENCES IN PERCENTS BETWEEN THE FIVE-PERCENTILE SCALES

Boys

Percentiles	17–14 yrs. Letter *a*	18–15 yrs. Letter *m*
5	24.4	7.1
10	20.7	5.4
15	17.0	6.0
20	24.4	4.7
25	12.9	4.4
30	11.9	4.0
35	10.6	3.2
40	9.2	2.3
45	8.4	1.5
50	8.2	1.0
55	7.4	.9
60	6.6	.8
65	5.6	.8
70	4.4	.7
75	3.3	.5
80	2.2	.4
85	1.7	.3
90	1.1	.2
95	.6	.1

TABLE 422

CANCELLATION — ACCURACY: AGE DIFFERENCES IN PERCENTS BETWEEN THE TEN-PERCENTILE SCALES

Boys

Percentiles	X		M	
	17–14 yrs. Letter *a*	18–15 yrs. Letter *m*	17–14 yrs. Letter *a*	18–15 yrs. Letter *m*
10	12.2	3.8	27.1	13.7
20	9.8	4.2	20.3	6.0
30	8.2	4.4	25.3	5.4
40	7.8	1.0	13.9	2.7
50	6.1	.7	11.0	2.0
60	4.3	.4	8.8	1.2
70	2.7	.2	7.3	.7
80	1.6	−.2	4.2	.3
90	.4	−.3	1.5	−.1

TABLE 423

CANCELLATION — INDEX: AGE DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Girls

Percentiles	17–14 yrs. Letter *a*	18–15 yrs. Letter *m*
5	90.7	29.6
10	86.3	25.2
15	76.4	26.1
20	65.4	22.5
25	58.4	21.0
30	54.1	19.6
35	50.9	18.8
40	47.6	19.5
45	44.5	20.1
50	41.3	20.7
55	38.9	21.5
60	36.8	21.5
65	34.6	21.4
70	31.9	21.5
75	29.6	21.4
80	28.1	21.4
85	26.2	16.5
90	24.4	9.3
95	22.8	2.1

TABLE 424

CANCELLATION — INDEX: AGE DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Girls

Percentiles	X		M	
	17–14 yrs. Letter *a*	18–15 yrs. Letter *m*	17–14 yrs. Letter *a*	18–15 yrs. Letter *m*
10	85.1	13.4	88.9	35.9
20	68.7	15.6	58.4	29.7
30	57.8	13.0	49.4	25.9
40	52.1	15.8	48.3	23.7
50	44.2	12.6	38.1	24.2
60	39.2	20.5	33.5	24.4
70	35.4	20.6	29.6	24.0
80	25.9	16.9	28.2	23.9
90	21.5	26.7	26.3	18.6

TABLE 425

CANCELLATION — ACCURACY: AGE DIFFERENCES IN PERCENTS BETWEEN THE FIVE-PERCENTILE SCALES

Girls

Percentiles	17–14 yrs. Letter *a*	18–15 yrs. Letter *m*
5	22.2	7.2
10	18.6	5.2
15	16.1	5.0
20	13.3	4.8
25	11.9	4.6
30	11.5	3.7
35	11.0	2.7
40	10.0	1.7
45	8.9	1.0
50	8.2	.8
55	7.7	.8
60	6.9	.7
65	5.8	.6
70	5.1	.5
75	4.2	.4
80	3.3	.3
85	2.3	.2
90	1.5	.2
95	.9	.1

for all boys, and Table 420 for school (X) and working (M) boys separately. Tables 421 and 422 make the comparison in terms of accuracy.

The gain in index between fourteen and seventeen, with the letter *a* used, is large, a median of 37 seconds. Between fifteen and eighteen, with the letter *m* used, the median gain is 25 seconds. Both school and working boys make large gains, which are much greater for those below than for those above the median. School boys gain more than working boys between fourteen and seventeen, whereas working boys gain more than school boys between fifteen and eighteen. Since in most of the tests of a routine type, similar to cancellation, school boys have reached the end of the period of rapid yearly gain earlier than working boys, the explanation of the greater gain of the working boys between fifteen and eighteen is doubtless found in their later maturity.

To determine the effect of the introduction of a new group of school boys at sixteen years upon the outcome, the percentiles for X_1 and X_2 in index of cancellation at sixteen (letter *w*) were worked out. The X_2 series proved slightly superior to X_1, in spite of a lack of previous experience with the test. However, the median difference was only 4 seconds, whereas the median gain for the entire X series was 25 seconds from fifteen to eighteen years.

In terms of accuracy the trend is in most respects similar. The gain is large from fourteen to seventeen (a median of 8 points) and much smaller from fifteen to eighteen (a median of 1.0 point). The gain is great for inaccurate boys at the bottom of the scale, but small at the top of the scale. It is larger for working than for school boys in both instances, doubtless because school boys were at the start nearer perfection in accuracy.

The corresponding age comparisons for girls are presented in Tables 423 to 426. There is a median gain of 41 seconds in index from fourteen to seventeen in cancelling the letter *a*, and of 21 seconds from fifteen to eighteen in cancelling the letter *m*. In the case of the girls also, differences in the lower ranges of the scales are much greater than those in the higher ranges. School girls, like the boys, gain more in index than working girls between fourteen and seventeen, while working girls gain more than school girls between fifteen and eighteen. A comparison of X_1 and X_2 girls in index of cancellation shows that the introduction of the X_2 girls had but a slight bearing on these differences, since at sixteen they were very slightly superior to X_1 girls. Their median is 3 seconds above that of X_1. In accuracy, the situation is the same as in the case of the boys. With the use of the letter *a*, the median gain in accuracy from fourteen to seventeen was 8 points, whereas with the use of the letter *m* the median gain from fifteen to eighteen was only 1 point. In both instances working girls gained more in accuracy than school girls, probably because they were farther from perfection at the start.

TABLE 426

CANCELLATION — ACCURACY: AGE DIFFERENCES IN PERCENTS BETWEEN THE TEN-PERCENTILE SCALES

Girls

PERCENTILES	X		M	
	17–14 yrs. Letter *a*	18–15 yrs. Letter *m*	17–14 yrs. Letter *a*	18–15 yrs. Letter *m*
10	14.6	4.8	20.5	6.9
20	12.6	4.5	19.0	4.9
30	10.5	3.2	14.7	4.0
40	8.7	1.7	11.9	1.4
50	6.9	1.0	10.4	.6
60	5.3	.6	8.8	.5
70	3.5	.3	7.1	.2
80	2.1	.1	5.1	−.1
90	.7	−.3	3.2	−.3

TABLE 427

SUBSTITUTION — INDEX: PRACTICE PAGE 1 — YEARLY DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Boys

PERCENTILES	15–14	16–15	17–16	18–17
5	21.6	24.4	−1.2	−.8
10	22.6	20.2	−.8	1.2
15	24.4	17.8	−1.4	.5
20	21.0	18.8	−.2	0
25	19.2	17.0	.6	−.3
30	18.2	15.4	1.0	−.5
35	18.2	14.6	1.6	−.8
40	18.0	14.2	1.0	−.2
45	17.6	13.6	1.0	.1
50	17.6	12.0	.8	.4
55	17.6	11.2	.2	1.1
60	16.8	11.2	.2	1.2
65	16.6	10.6	0	1.7
70	15.8	10.2	.6	1.5
75	15.0	11.2	0	1.1
80	13.4	11.4	−.2	.9
85	13.6	9.6	−.2	.5
90	14.6	7.2	−.4	.2
95	12.0	10.4	−.8	1.0

Substitution

This test, next to memory, furnished the most constant conditions from year to year for the five years. The method of administration of the test was changed at sixteen years by reducing the practice pages from three to two. Accordingly, year fifteen to sixteen cannot be used for comparison with other years except on the first page, which was not modified by the change of procedure.

The yearly differences for the percentile scales of page 1 are presented in Table 427 for the entire group of boys, and in Table 428 for school (X) and working boys (M) separately. The tables show a large gain in index from fourteen to fifteen (a median of 18 seconds) and a smaller one from fifteen to sixteen (a median of 12 seconds). Above sixteen there is no gain.

In considering the records of the school group, it seemed possible that the small gain between fifteen and sixteen might be due to the introduction

TABLE 428

SUBSTITUTION — INDEX: PRACTICE PAGE 1 — YEARLY DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Boys

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	29.4	10.2	5.9	14.5	21.7	24.7	−1.8	6.8
20	28.3	5.6	9.1	10.4	21.9	24.8	−2.2	4.6
30	30.7	4.2	5.2	12.8	20.4	21.4	− .4	2.7
40	27.9	6.6	3.4	10.8	17.9	19.9	.4	2.7
50	25.4	9.5	1.7	8.8	15.4	18.5	.4	2.9
60	23.2	9.6	1.6	7.8	12.3	16.9	1.1	3.1
70	21.5	9.1	1.5	7.0	10.2	15.1	1.3	3.6
80	19.0	7.5	1.6	10.6	9.7	11.9	2.4	4.2
90	17.2	9.0	1.6	8.6	7.0	15.1	.7	2.3

TABLE 429 — SUBSTITUTION — INDEX (IN SECONDS): PAGE 1

Boys 16 Years

Percentiles	X_1	X_2	$(X_2–X_1)$
10	159.6	158.8	.8
20	149.6	142.0	7.6
30	139.6	132.2	7.4
40	130.8	124.0	6.8
50	122.0	117.2	4.8
60	115.4	112.0	3.4
70	109.2	107.0	2.2
80	103.0	102.0	1.0
90	93.2	91.6	1.6

TABLE 430

SUBSTITUTION — INDEX: PRACTICE PAGE 2 — YEARLY DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Boys

PERCENTILES	15–14	17–16	18–17
5	14.2	1.8	−5.1
10	16.4	5.8	−5.7
15	14.2	3.4	−2.3
20	14.7	3.8	−1.7
25	11.8	4.4	−1
30	11.2	4.2	0
35	11.9	3.0	0
40	13.1	2.0	.2
45	13.4	1.0	.6
50	13.6	.4	.5
55	13.8	−.4	.7
60	14.0	−.8	.7
65	13.6	−.8	.8
70	13.6	−.4	.6
75	13.8	−.2	.5
80	13.6	.4	.2
85	12.8	.6	.2
90	9.2	2.6	.6
95	11.5	.8	2.4

TABLE 431

SUBSTITUTION — INDEX: PRACTICE PAGE 2 — YEARLY DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Boys

PERCENTILES	X			M		
	15–14	17–16	18–17	15–14	17–16	18–17
10	24	7.1	17.2	16.3	3.3	−1.6
20	22.8	7.3	13.8	13.8	3.6	− .6
30	21.3	4.5	12.6	11.5	− .4	.7
40	21	4	8.4	7.7	4.0	1.1
50	22.3	1.9	7.6	9.5	2.1	1.6
60	21.0	1.6	7.4	11.0	.4	2.1
70	17.7	1.4	7.3	12.2	−1.3	2.9
80	17.9	1	11.0	9.6	0	1.4
90	14	1.1	9.6	11.3	1.5	− .3

of a new and unpracticed group of school children at sixteen. To test this hypothesis, the records for the first group of school boys (X_1) and the second group (X_2) were summed up separately and are given in Table 429. The second group of boys, in spite of lack of practice, is slightly superior to the first. Accordingly none of the decreased rate of gain can be attributed to the new group.

Between fourteen and fifteen school boys gain faster than working boys, but between fifteen and sixteen working boys gain much faster than school boys. Above sixteen the gains are small for both groups. Between seventeen and eighteen, school boys gain more than working boys.

The corresponding facts for page 2 of the substitution test are shown in Tables 430 and 431. Since at sixteen years, and over, page 2 was given with a warning that the memory page would follow it, but under sixteen without that warning, no direct comparison of the change from fifteen to sixteen can be made. The gain on page 2 from fourteen to fifteen is large (14 seconds), but above sixteen there is no change. The same type of

TABLE 432—SUBSTITUTION—INDEX: PRACTICE PAGE 2—YEARLY DIFFERENCES IN SECONDS, WITH CHANGED INSTRUCTIONS, BETWEEN THE TEN-PERCENTILE SCALES

Boys

Percentiles	X 16–15	M 16–15
10	−3.5	14.7
20	−2.2	22.7
30	− .2	14.4
40	.9	9.9
50	−.8	9.6
60	−1.2	9.4
70	.4	9.5
80	.2	9.6
90	.3	5.0

TABLE 433—SUBSTITUTION—INDEX: PRACTICE PAGE 3—YEARLY DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Boys

Percentiles	15–14	Percentiles	15–14
5	6.6	55	9.2
10	9.4	60	9.0
15	8.8	65	9.1
20	8.2	70	8.4
25	10.2	75	7.8
30	9.4	80	7.2
35	7.2	85	7.8
40	8.0	90	8.9
45	8.4	95	4.5
50	9.0		

TABLE 434

SUBSTITUTION — INDEX: PRACTICE PAGE 3 — YEARLY DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Boys

PERCENTILES	X 15–14	M 15–14
10	23.1	8.6
20	17.9	7.0
30	15.4	5.8
40	15.8	6.1
50	15.0	4.2
60	14.1	5.1
70	12.5	5.6
80	12.7	4.5
90	10.4	2.7

TABLE 435

SUBSTITUTION — INDEX: SUM OF THE PRACTICE PAGES — YEARLY DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Boys

PERCENTILES	15–14	17–16	18–17
5	48	−3	0
10	46	−1	3
15	40	5	1
20	42	5	−3
25	41	7	−3
30	39	6	0
35	33	6	3
40	41	5	3
45	41	2	4
50	38	−1	5
55	37	−1	5
60	40	−1	5
65	38	0	4
70	37	0	4
75	36	1	2
80	36	0	2
85	38	1	3
90	34	0	4
95	27	−7	9

difference between school and working boys obtains as on page 1. School boys gain far more than working boys from fourteen to fifteen. Above sixteen, working boys are at a standstill, but school boys gain from seventeen to eighteen. The fifteen-to-sixteen-year difference for the two groups is shown in Table 432. School boys made no gain after receiving the warning that the next page would be performed from memory, whereas working boys did. The results show a much greater degree of caution and forethought on the part of the school boys. The working boys plugged ahead without consideration of the fact that the page constituted a last chance for learning. Page 3 was given as a practice page only at years fourteen and fifteen. The gain during that year is given in Table 433 for the entire group of boys, and in Table 434 for working and school boys separately. The gain is still marked (9 seconds), and is greater for school than for working boys. The sum of the indices of the practice pages form the basis of Table 435 for the entire group of boys, and of Table 436 for school (X) and working (M) boys separately. This table shows the very large gain from fourteen to fifteen—a median gain of 38 seconds—and the very small gain above sixteen. The chief contrast between school (X) and working (M) boys is the greater rate of gain of the school boys between fourteen and fifteen, and again between seventeen and eighteen.

The tables showing the yearly differences in index on the memory page are given for the whole group of boys in Table 437, and for the school (X) and working (M) boys separately in Table 438. The tables show a gain in index between fourteen and fifteen. In other words, there is not only a great gain in the speed of filling in the practice pages during the year fourteen to fifteen, but the memory page is also better done. The amount of gain is greater for the school than for the working boys, (a median of 14 seconds as against 6 seconds). Above sixteen there is little or no change except at the lower end of the scale, where there is a gain.

The yearly differences based upon accuracy of the memory page are shown in Table 439 for the entire group of boys, and in Table 440 for school (X) and working (M) boys separately. The accuracy is perfect in so high a percentage of cases that the differences are at best small. There is a slight gain each year.

The yearly differences in index for page 1 are shown for the entire group of girls in Table 441, and for school (X) and working (M) girls separately in Table 442. The tables show a large gain (a median of 18 seconds) from fourteen to fifteen and a smaller gain (a median of 8 seconds) from fifteen to sixteen; above sixteen there is little gain. A comparison of the school and working girls shows that school girls on the whole gain most. Adult capacity is reached at sixteen among working girls and at seventeen among school girls.

Table 443 shows that the unpracticed girls who began at sixteen

TABLE 436

SUBSTITUTION — INDEX: SUM OF THE PRACTICE PAGES — YEARLY DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Boys

Percentiles	X			M		
	15–14	17–16	18–17	15–14	17–16	18–17
10	107	25	43	28	27	10
20	73	14	28	31	1	7
30	66	6	25	33	1	5
40	63	4	22	34	3	11
50	61	2	21	28	4	9
60	58	2	18	29	2	9
70	55	1	15	24	−5	9
80	54	2	15	19	−2	−18
90	41	1	16	11	3	−15

TABLE 437

SUBSTITUTION — INDEX: MEMORY PAGE — YEARLY DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Boys

Percentiles	Page 4	Page 3	
	15–14	17–16	18–17
5	17.3	13.8	8.3
10	6.4	4.9	7.8
15	16.2	9.5	−7.7
20	9.7	7.9	−1.1
25	12.2	6.3	−2.1
30	14.5	2.2	−4.7
35	10.3	− .5	−3.2
40	8.9	.3	−1.5
45	9.1	.7	−1.2
50	8.5	.9	−1.3
55	7.2	1.3	.1
60	7.2	1.7	1.0
65	7.6	.7	1.7
70	7.9	− .4	2.4
75	8.3	− .9	3.1
80	8.8	−1.8	2.9
85	6.5	−1.8	2.4
90	5.9	−1.4	1.7
95	3.6	.7	.7

TABLE 438

SUBSTITUTION — INDEX: MEMORY PAGE — YEARLY DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Boys

Percentiles	X	M	X		M	
	15–14	15–14	17–16	18–17	17–16	18–17
10	45.2	−12.5	−11.1	45.6	17.4	12.4
20	30.0	− .9	− 8.2	30.4	24.1	−3.2
30	20.0	5.4	− 8.7	20.9	21.7	−8.6
40	15.3	6.3	− 4.9	18.1	5.1	−6.2
50	14.2	6.3	− 1.1	16.1	6.4	−3.1
60	12.8	5.8	− 1.7	15.0	5.6	− .4
70	11.4	5.3	− 3.1	12.9	3.9	.7
80	11.7	5.1	− .5	6.6	1.7	1.3
90	6.8	5.5	− 1.3	6.3	−.9	2.2

TABLE 439

SUBSTITUTION—ACCURACY: MEMORY PAGE—YEARLY DIFFERENCES IN PER CENT OF ACCURACY BETWEEN THE FIVE-PERCENTILE SCALES

Boys

Percentiles	Page 4 15–14	Page 3 17–16	Page 3 18–17
5	1.2	.4	−2.1
10	1.5	1.1	3.7
15	3.6	1.7	1.0
20	3.3	1.4	.5
25	2.7	1.0	1.8
30	2.5	.7	.8
35	1.7	.8	.9
40	1.4	.7	1.6
45	1.2	.6	2.4
50	.7	.4	2.4
55	.8	.3	2.4
60	.6	.3	2.5
65	2.0	2.1	.0
70	1.6	.0	.0
75	.0	.0	.0
80	.0	.0	.0
85	.0	.0	.0
90	.0	.0	.0
95	.0	.0	.0

performed this test better than those who had had the two previous trials. Accordingly we must conclude that the drop in gain of the school girls was not conditioned by the introduction of new and unpracticed individuals.

The yearly differences for page 2 are shown in Tables 444 and 445. The tables show a large gain from fourteen to fifteen (a median of 13 seconds), but small gains above sixteen years. The differences between school and working girls are similar to those of page 1. School girls gain much more from fourteen to fifteen than working girls. Between sixteen and eighteen school girls gain slightly more, although in the year seventeen to eighteen the gain is a bit larger for working girls.

The modification of the difference from fifteen to sixteen brought about by the change of method at sixteen, is of interest because it affected the school and working girls differently just as it did the two groups of boys. The two sets of differences are shown in Table 446.

The warning that page 2 would be the last practice page led the school girls to take relatively more time for it at sixteen years, and accordingly make no gain in record above the fifteen-year rate. The working girls, however, went ahead with a maximum speed in spite of the warning, and therefore did make a gain. The school girls show greater caution and concern for the outcome than the working girls.

Page 3 was given as a practice page only in year fourteen to fifteen. It shows the same tendency (Tables 447 and 448) as the two previous practice pages: a gain, less in amount, but still large (10 seconds) for the whole group, but a much larger gain for the school than for the working girls (a median of 17 seconds as against 4 seconds).

The yearly differences in terms of the sum of the practice pages (index) are shown for the whole group of girls in Table 449, and for school (X) and working (M) girls separately in Table 450. They show a very large yearly gain between fourteen and fifteen, when three practice pages were used (a median of 43 seconds), a small gain from sixteen to seventeen (median 7 seconds), and still less from seventeen to eighteen (median 2 seconds). The contrast between school and working girls is that school girls gain far more than working girls. This is strikingly true up to seventeen years. Between seventeen and eighteen the gain is slightly greater for the working group.

The yearly differences in the index of the memory page are shown in Table 451 for the entire group of girls, and in Table 452 for school girls and working girls separately. There is a consistent gain in index of the memory page up to eighteen years. It is particularly evident in the lower ranges of the scale. The gain is larger between fourteen and fifteen than between sixteen and eighteen (a median of 12 as against 5 seconds). The chief contrast between school and working girls in the memory page is the same as it was on the practice page. School girls gain more on the whole than

TABLE 440

SUBSTITUTION—ACCURACY: MEMORY PAGE—YEARLY DIFFERENCES IN PER CENT OF ACCURACY BETWEEN THE TEN-PERCENTILE SCALES

Boys

Percentiles	X			M		
	Page 4 15–14	Page 3 17–16	Page 3 18–17	Page 4 15–14	Page 3 17–16	Page 3 18–17
10	6.7	.0	4.8	−3.4	3.1	1.8
20	4.2	.4	5.5	2.1	2.8	−1.6
30	2.8	.7	5.9	2.7	2.2	− .7
40	1.3	1.2	3.6	1.5	1.6	.4
50	.7	2.0	1.8	.5	.9	1.9
60	.8	1.9	6	.4	.6	2.0
70	.4	.0	.0	.3	.0	.0
80	.3	.0	.0	1.0	.0	.0
90	.1	.0	.0	.0	.0	.0

TABLE 441

SUBSTITUTION—INDEX: PRACTICE PAGE 1—YEARLY DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Girls

Percentiles	15–14	16–15	17–16	18–17
5	27.6	13.4	−1.2	.7
10	23.6	13.8	.2	−2.5
15	21.0	12.6	.6	−1.2
20	20.0	12.8	.6	.7
25	18.4	11.2	.8	1.2
30	18.8	11.0	1.2	3.7
35	18.8	11.6	1.4	2.2
40	18.4	10.6	1.4	2.0
45	18.3	9.7	1.8	1.0
50	18.2	8.4	1.4	1.4
55	16.6	9.0	1.6	1.2
60	16.8	8.0	1.8	.8
65	15.8	7.8	2.0	.8
70	15.0	8.2	2.8	.2
75	13.6	9.0	3.0	−.3
80	11.8	8.8	4.4	−.9
85	12.6	−1.8	3.6	−1.6
90	13.6	6.4	5.2	.2
95	9.0	9.5	4.3	−1.6

working girls. Their more rapid yearly gain is striking up to seventeen years. Between seventeen and eighteen, the gain of the working group is slightly greater. It seems probable, therefore, that school girls, particularly the most efficient of them, have reached an adult capacity in routine learning at seventeen. The less efficient school girls and the working girls go on gaining up to eighteen and perhaps beyond.

The yearly differences for accuracy on the memory page are shown in Table 453 for the entire group of girls, and in Table 454 for school (X) and working (M) girls separately. The best quarter of the girls have a perfect accuracy throughout the years, and therefore show no improvement. In the lower three-quarters, a small but steady gain in accuracy from year to year is present. A comparison of working and school girls shows no consistent tendency from year to year. Between fourteen and fifteen the improvement in accuracy is due entirely to the working group, and between

TABLE 442

SUBSTITUTION—INDEX: PRACTICE PAGE 1—YEARLY DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Girls

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	34.0	12.1	8.5	4.2	16.5	21.6	−3.0	−2.1
20	28.9	13.1	5.1	2.6	15.4	13.5	−1.7	2.1
30	25.7	11.6	5.7	1.8	13.1	12.4	−.2	4.8
40	24.6	8.8	8.2	1.4	14.3	10.7	1.1	6.3
50	22.3	8.5	8.4	.4	14.0	10.3	1.0	4.0
60	20.6	7.0	9.5	−.4	13.8	8.5	.1	4.3
70	18.7	7.8	8.0	−1.0	12.3	8.2	−.8	4.3
80	17.7	5.8	8.6	−1.6	9.8	10.4	−4.5	6.7
90	15.7	5.8	9.0	−6.1	4.7	14.2	−2.4	3.8

TABLE 443

SUBSTITUTION — INDEX (IN SECONDS): PAGE 1

Girls—16 Years

Percentiles	X_1	X_2	X_2–X_1
10	168.8	156.0	12.8
20	146.8	139.2	7.6
30	136.8	132.0	4.8
40	131.0	124.8	6.2
50	126.0	118.0	8.0
60	119.8	112.0	7.8
70	113.2	106.6	6.6
80	106.6	102.0	4.6
90	99.8	92.0	7.8

TABLE 444

SUBSTITUTION — INDEX: PRACTICE PAGE 2 — YEARLY DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Girls

Percentiles	15–14	17–16	18–17
5	19.6	2.2	−1.0
10	15.4	3.4	−2.0
15	15.8	4.8	−1.5
20	16.8	4.0	1.7
25	17.0	4.6	4.9
30	16.6	4.4	3.1
35	16.4	2.6	3.7
40	15.6	2.6	4.1
45	13.4	2.6	4.5
50	13.2	2.4	4.9
55	11.8	2.2	4.8
60	11.0	2.2	4.2
65	10.4	2.0	3.5
70	10.0	2.0	2.9
75	9.6	2.0	2.3
80	11.2	1.6	1.9
85	10.2	1.6	1.3
90	9.2	3.0	2.2
95	10.6	1.6	1.8

TABLE 445

SUBSTITUTION — INDEX: PRACTICE PAGE 2 — YEARLY DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Girls

Percentiles	X			M		
	15–14	17–16	18–17	15–14	17–16	18–17
10	22.7	14.9	.4	8.0	−.3	1.6
20	24.1	9.9	3.2	13.7	.6	2.6
30	21.8	6.4	5.6	14.7	1.8	8.7
40	19.2	6.3	4.2	12.6	2.1	5.9
50	16.3	4.0	3.2	11.4	1.5	6.7
60	15.6	4.1	2.2	8.9	1.2	7.5
70	15.4	3.9	1.7	6.4	−1.0	7.6
80	14.5	3.9	1.7	3.8	.6	5.5
90	13.4	5.6	.8	4.1	−.3	3.3

sixteen and seventeen it is due entirely to the school group. Between seventeen and eighteen the working girls gain most.

The results indicate that in the copying part of the test large yearly gains cease at sixteen years. Above that point some improvement takes place, which is in general greater among school than among working children. In the memory part of the test, which is the measure of the perfection of learning, the same thing is substantially true of yearly gains, except for the group of very inferior girls, who keep on gaining up to eighteen years. The gains in accuracy are small, because of the high proportion of perfect records, but they keep on up to eighteen years.

TABLE 446

SUBSTITUTION—INDEX: PRACTICE PAGE 2—YEARLY DIFFERENCES IN SECONDS, WITH CHANGED INSTRUCTIONS, BETWEEN THE TEN-PERCENTILE SCALES

Girls

Percentiles	X 16–15	M 16–15
10	−5.5	10.8
20	−2.1	5.6
30	.3	4.1
40	2.0	5.7
50	3.3	4.9
60	2.5	5.1
70	1.4	5.2
80	−1.0	7.7
90	−2.0	5.0

TABLE 447

SUBSTITUTION—INDEX: PRACTICE PAGE 3—YEARLY DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Girls

Percentiles	15–14	Percentiles	15–14
5	13.0	55	10.0
10	14.0	60	9.8
15	11.2	65	9.8
20	10.4	70	8.6
25	11.8	75	7.4
30	11.0	80	6.6
35	9.6	85	7.0
40	9.4	90	7.0
45	9.8	95	3.4
50	10.2		

TABLE 448

SUBSTITUTION — INDEX: PRACTICE PAGE 3 — YEARLY DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Girls

Percentiles	X 15–14	M 15–14
10	21.4	5.1
20	17.8	5.5
30	18.0	6.8
40	18.3	4.5
50	17.4	4.0
60	15.8	3.5
70	14.4	3.1
80	13.9	1.0
90	11.2	−1.0

TABLE 449

SUBSTITUTION — INDEX: SUM OF THE PRACTICE PAGES — YEARLY DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Girls

Percentiles	15–14	17–16	18–17
5	41	6	3
10	55	9	−8
15	54	10	−3
20	52	11	1
25	47	9	1
30	46	7	0
35	41	8	−1
40	40	8	−1
45	41	7	1
50	43	7	2
55	42	6	4
60	40	5	4
65	37	5	4
70	34	6	3
75	32	7	1
80	31	8	1
85	29	9	1
90	28	8	0
95	25	7	0

TABLE 450

SUBSTITUTION — INDEX: SUM OF THE PRACTICE PAGES — YEARLY DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Girls

Percentiles	X			M		
	15–14	17–16	18–17	15–14	17–16	18–17
10	92	31	−1	27	8	−6
20	73	16	2	31	3	3
30	55	12	5	34	1	7
40	63	11	6	28	1	7
50	57	12	5	26	4	8
60	54	16	3	32	0	12
70	52	18	1	23	−3	14
80	44	19	−1	15	−2	14
90	38	19	22	5	−10	16

TABLE 451

SUBSTITUTION — INDEX: MEMORY PAGE — YEARLY DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Girls

Percentiles	Page 4	Page 3	
	15–14	17–16	18–17
5	33.4	17.3	1.8
10	28.0	−.8	27.0
15	22.6	3.0	28.3
20	17.6	15.7	16.6
25	15.5	15.5	11.2
30	14.0	11.0	8.3
35	11.8	7.0	7.5
40	10.2	5.2	6.3
45	11.5	5.7	6.9
50	11.5	5.1	5.0
55	10.6	4.6	3.4
60	9.8	5.8	1.6
65	9.7	5.3	1.3
70	9.5	4.8	1.0
75	9.5	4.6	.7
80	9.7	4.8	−.2
85	8.3	3.6	−1.2
90	7.0	3.4	−1.4
95	6.8	4.2	−1.6

TABLE 452

SUBSTITUTION — INDEX: MEMORY PAGE — YEARLY DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Girls

Percentiles	X	M	X		M	
	15–14	15–14	17–16	18–17	17–16	18–17
10	50.7	−8.1	27.1	45.6	−22.3	42.9
20	25.4	8.4	22.9	35.1	20.3	21.0
30	16.2	10.3	16.8	13.6	14.6	9.9
40	15.7	10.3	9.6	7.7	3.8	7.1
50	17.5	8.7	8.1	1.0	3.4	4.0
60	18.6	5.4	8.2	−1.6	4.7	5.0
70	15.8	4.1	7.8	−3.4	5.5	3.2
80	13.1	2.6	5.1	−7.7	4.1	4.0
90	18.8	3.1	2.0	0	4.2	1.6

TABLE 453

SUBSTITUTION — ACCURACY: MEMORY PAGE — YEARLY DIFFERENCES IN PER CENT OF ACCURACY BETWEEN THE FIVE-PERCENTILE SCALES

Girls

Percentiles	Page 4	Page 3	
	15–14	17–16	18–17
5	2.4	3.1	4.4
10	1.8	4.7	3.2
15	2.2	3.3	2.4
20	1.4	2.6	3.3
25	2.4	1.5	4.7
30	2.4	2.4	4.2
35	1.7	1.9	3.6
40	2.1	1.7	3.1
45	1.3	1.3	2.7
50	.7	1.1	2.3
55	.5	.7	2.0
60	.1	.7	1.8
65	1.8	2.7	−.3
70	0	2.1	0
75	0	0	0
80	0	0	0
85	0	0	0
90	0	0	0
95	0	0	0

TABLE 454

SUBSTITUTION — ACCURACY: MEMORY PAGE — YEARLY DIFFERENCES IN PER CENT OF ACCURACY BETWEEN THE TEN-PERCENTILE SCALES

Girls

Percentiles	X			M		
	Page 4 15–14	Page 3 17–16	Page 3 18–17	Page 4 15–14	Page 3 17–16	Page 3 18–17
10	.0	15.4	−2.9	3.8	−1.9	6.4
20	−.6	9.3	−1.8	4.4	− .2	5.8
30	−3.0	5.7	2.9	4.7	−1.3	8.3
40	.9	2.8	1.4	3.7	1.1	3.6
50	.2	3.6	.7	1.4	.5	2.5
60	.0	3.0	.0	.8	.4	1.9
70	.0	.0	.0	.3	2.4	−.3
80	.0	.0	.0	.2	.0	.0
90	.0	.0	.0	.0	.0	.0

MEMORY

The memory test is the only mental test which was repeated each year for the five years without modifications of method or content. To test the amount of modification due to the new groups, percentiles for the nine-place series were figured separately for the first (X_1) and the second (X_2) school groups at sixteen years. The results are presented in Table 455. They show that the new group of boys had very slightly poorer records than the original group. However, the order of difference between the first and second school groups is so much less than the yearly differences between fifteen and seventeen that the yearly comparisons are scarcely modified by it. The median difference between the two school groups is

TABLE 455

MEMORY: 9-PLACE SERIES — PER CENT CORRECT

Boys — 16 Years

Percentiles	X_1	X_2	X_2–X_1
10	60.9	58.0	−2.9
20	67.9	65.4	−2.5
30	71.6	71.4	− .2
40	77.5	78.2	.7
50	82.7	81.8	− .9
60	86.8	85.3	−1.5
70	89.8	91.9	2.1
80	93.3	93.3	.0
90	95.7	95.2	− .5

TABLE 456 — MEMORY: YEARLY DIFFERENCES IN PER CENT OF ACCURACY BETWEEN THE FIVE-PERCENTILE SCALES

Boys

PERCENTILES	7-PLACE SERIES				8-PLACE SERIES			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
5	3.0	7.0	−2.8	2.0	3.6	6.8	.6	1.3
10	4.6	6.5	−4.4	2.2	5.5	6.7	1.1	− .2
15	7.0	3.6	+ .4	−1.8	6.1	6.9	.3	1.2
20	8.0	2.9	−1.0	.3	6.6	7.6	.1	.3
25	4.7	1.8	.5	− .9	4.8	7.9	3.0	−1.5
30	3.9	1.0	.5	− .9	4.3	8.3	3.2	− .1
35	3.7	.7	− .7	−1.4	3.8	10.0	2.0	− .6
40	3.5	.3	1.0	−1.8	5.0	8.3	3.1	−1.6
45	3.5	− .7	1.9	−2.2	6.7	6.7	3.0	.1
50	3.8	−1.2	1.6	−2.3	5.6	7.1	1.2	− .2
55	3.0	−1.0	1.4	−2.1	4.8	5.5	1.5	− .5
60	2.4	−1.1	1.3	−1.7	5.1	3.9	1.8	−1.2
65	1.8	−1.3	1.4	−1.4	4.4	2.5	1.9	− .8
70	1.5	−1.0	1.0	−1.0	2.7	1.9	1.4	− .8
75	1.3	− .8	.7	− .8	2.4	1.0	1.3	− .7
80	1.4	− .8	.4	−1.1	1.9	.9	.7	− .7
85	1.0	− .7	.2	− .9	1.3	.5	.7	− .6
90	.8	− .6	.3	− .6	.8	.1	.7	− .1
95	.3	− .3	.2	− .2	.4	.4	.0	.0

PERCENTILES	9-PLACE SERIES			
	15–14	16–15	17–16	18–17
5	2.7	3.1	.2	.1
10	2.0	5.4	1.6	−2.4
15	2.4	5.5	2.9	−2.6
20	1.8	5.1	2.6	−2.0
25	1.7	5.6	3.4	−1.4
30	1.9	5.5	4.5	−1.5
35	2.4	5.0	5.4	− .7
40	2.8	5.6	5.3	− .8
45	3.0	6.1	4.8	−1.2
50	2.9	5.8	6.2	−2.3
55	2.9	6.1	6.2	−2.8
60	3.9	5.9	5.0	−1.4
65	6.4	3.0	5.0	−1.6
70	4.7	3.7	3.6	−1.4
75	3.6	3.3	3.8	− .5
80	3.4	3.5	3.0	−1.4
85	2.7	1.5	3.3	−1.1
90	1.1	1.4	1.7	−1.2
95	1.1	− .1	1.7	− .6

only 0.9 per cent, whereas the median age differences from fifteen to seventeen for the entire school group are 7.4 and 6.1 per cent. The comparison of X_1 and X_2 boys at sixteen years in the seven-place series showed a difference of less than .5 in favor of the X_2 group, except for the ten percentile, where the X_2 group stood 3.8 ahead.

The yearly differences for the whole group of boys, in seventh-, eighth-, and ninth-place series separately, and in the sum of the three series, are given in Tables 456 and 457. The corresponding differences for school boys (X) and working boys (M) separately are given in Tables 458 and 459. The tables for the entire group show that in the seven-place series there is no clear gain after fifteen years. In the year fifteen to sixteen there is still improvement in the lowest quarter of the scale. Those with the very poorest records continue to improve up to sixteen. Beyond sixteen the differences are small and vary from negative to positive.

The eight-place series shows gains up to seventeen years. The gain is large in the year fourteen to fifteen (a median of 5.6 per cent), still larger at fifteen to sixteen (median 7.0 per cent), and small from seventeen to eighteen. The nine-place series shows the same tendency and has the same limit of improvement at seventeen years. In this case the rate of gain is largest between fifteen and seventeen years. The more difficult the series, the later the period of rapid yearly gain falls. The sum of the three series

TABLE 457

MEMORY: SUM OF THE 7-, 8-, AND 9-PLACE SERIES — YEARLY DIFFERENCES BETWEEN THE FIVE-PERCENTILE SCALES

Boys

Percentiles	15–14	16–15	17–16	18–17
5	12	26	−7	0
10	13	21	−4	5
15	14	18	−2	6
20	16	17	−1	3
25	15	18	−1	2
30	14	19	0	2
35	14	18	1	2
40	13	18	2	2
45	13	18	3	1
50	12	18	4	1
55	12	17	4	1
60	12	16	4	1
65	12	16	3	1
70	12	14	3	1
75	11	12	3	−1
80	10	10	5	1
85	6	8	8	0
90	4	8	3	0
95	5	1	0	0

TABLE 458

MEMORY: YEARLY DIFFERENCES IN PER CENT OF ACCURACY BETWEEN THE TEN-PERCENTILE SCALES

Boys

7-Place Series

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	3.2	6.9	−1.2	4.7	10.5	7.8	−6.5	2.8
20	5.1	1.7	.4	.7	13.3	3.9	−2.4	−1.9
30	4.4	.3	1.2	−.4	4.5	3.8	−.6	−1.6
40	4.1	−.4	1.4	−1.4	3.3	3.5	−1.6	−1.3
50	3.2	−1.1	.4	−1.4	3.1	2.1	−1.2	−1.8
60	1.8	−1.3	1.5	−.7	3.0	1.1	−.6	−1.5
70	1.3	−.7	.7	−.7	2.0	.8	−.4	−1.0
80	.9	−.9	.7	−.7	1.4	.4	−.3	−.6
90	.4	−.5	.0	.0	.7	.3	−.2	−.9

8-Place Series

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	8.1	13.7	−1.4	1.8	7.7	4.3	−1.1	5.3
20	6.5	9.2	3.7	1.3	7.3	5.2	1.0	2.3
30	4.6	10.3	4.4	−3.7	4.3	8.1	2.9	.2
40	8.3	7.9	1.8	.8	3.6	10.6	1.1	−1.5
50	6.2	4.2	2.9	−.9	6.0	9.1	.8	1.0
60	5.5	1.8	2.6	−.6	4.3	6.9	.1	.2
70	2.8	.3	2.2	−.9	3.6	4.7	−.1	−.1
80	1.3	.1	1.3	−.7	1.5	3.4	−.2	−.4
90	.7	.1	.3	−.3	1.5	.1	.9	−.1

9-Place Series

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	5.6	6.1	2.7	1.0	1.9	4.1	1.3	−.5
20	2.8	6.2	5.4	−1.3	1.2	6.6	1.8	−1.7
30	3.2	5.6	6.9	−.4	2.4	6.7	.7	.9
40	3.4	7.3	7.6	−2.8	3.7	5.3	4.0	2.3
50	4.1	7.4	6.1	−2.3	3.4	4.9	5.3	.6
60	7.5	4.4	5.4	−3.4	2.3	7.4	4.5	.3
70	4.3	4.9	4.8	−3.2	5.8	4.5	2.8	.0
80	3.3	2.4	3.8	−.5	3.6	3.3	2.2	1.0
90	2.9	−.7	3.1	−.7	1.5	1.3	1.9	−.1

shows large gains from fourteen to sixteen, but negligible ones from sixteen to eighteen. As a general summary, it is fair to say that fifteen years marks the limit of gain for the seven-place series, sixteen years for the eight-place series, and seventeen years for the nine-place series.

In comparing the tables for working and school boys, an interesting type of difference appears. Working boys make larger gains than school boys in the seven-place series, but school boys make larger gains than working boys in the eight- and nine-place series. There is very little gain in the working group after sixteen years. What little there is shows in the nine-place series. The school group shows consistent gains up to seventeen years.

As an indication of the extent to which yearly differences in memory among girls were modified by the introduction of the new school series at

TABLE 459

MEMORY — SUM OF 7-, 8-, AND 9-PLACE SERIES: YEARLY DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES

Boys

Percentiles	X				M			
	15–14	13–15	17–16	18–17	15–14	16–15	17–16	18–17
10	14	20	2	−1	20	16	−4	10
20	16	19	5	−3	18	15	−1	11
30	19	19	4	0	16	16	0	7
40	17	19	5	−4	9	17	1	8
50	17	17	5	−1	10	17	3	7
60	15	16	3	0	9	16	5	6
70	14	9	8	−1	11	14	4	5
80	10	8	9	−1	8	11	4	5
90	7	5	1	0	4	6	6	1

TABLE 460

MEMORY — 9-PLACE SERIES: PER CENT CORRECT

Girls — 16 Years

Percentiles	X_1	X_2	X_2–X_1
10	54.5	63.8	9.3
20	66.7	68.6	1.9
30	72.2	73.2	1.0
40	77.1	76.3	− .8
50	82.3	81.6	− .7
60	86.4	86.5	.1
70	91.4	88.1	−3.3
80	93.4	93.1	− .3
90	96.2	96.4	.2

TABLE 461 — MEMORY: YEARLY DIFFERENCES IN PER CENT OF ACCURACY BETWEEN THE FIVE-PERCENTILE SCALES

Girls

Percentiles	7-Place Series				8-Place Series			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
5	8.1	5.1	−4.3	−2.5	4.2	8.1	3.4	2.3
10	6.9	5.3	−4.9	2.3	6.5	6.1	4.8	2.1
15	9.7	2.1	−1.3	− .1	6.6	6.4	2.1	1.9
20	8.7	1.8	−2.4	1.4	5.4	7.3	1.9	2.1
25	5.1	2.0	.0	− .4	3.7	8.3	3.0	.1
30	4.1	.9	.9	− .9	3.1	9.2	2.8	.6
35	3.9	.5	1.3	−1.3	3.4	9.6	2.5	−.3
40	3.9	−1.0	2.6	−2.0	5.9	6.5	3.7	1.3
45	4.0	−1.8	2.4	−1.7	6.8	5.9	2.6	.9
50	3.5	−1.7	2.0	−1.9	4.7	5.6	1.2	1.1
55	2.7	−1.4	1.7	−1.7	4.9	4.1	1.2	.8
60	2.1	−1.2	1.3	−1.3	5.0	2.7	1.3	.5
65	1.6	− .9	2.0	−1.3	3.7	1.7	1.6	.2
70	1.3	−1.3	1.3	−1.3	2.8	1.2	1.1	.2
75	1.3	−1.1	1.1	−1.0	2.7	.3	1.1	.1
80	1.1	− .8	.6	− .6	2.1	.5	.5	.1
85	.7	− .8	.5	− .3	1.1	.5	.6	.0
90	.8	−1.0	.7	− .4	.9	−.1	.6	.1
95	−.2	.3	.3	− .3	.4	−.3	.6	.0

Percentiles	9-Place Series			
	15–14	16–15	17–16	18–17
5	.9	3.3	2.6	6.8
10	2.9	3.9	4.9	2.9
15	4.2	2.8	4.0	3.1
20	2.0	2.9	3.0	3.8
25	1.7	6.7	1.8	3.4
30	1.1	6.7	2.6	3.2
35	.9	6.6	3.3	3.1
40	1.0	6.6	5.4	1.3
45	1.2	5.7	6.3	.4
50	1.5	6.4	5.3	.0
55	1.9	5.0	6.5	− .3
60	2.9	3.8	6.5	−1.5
65	2.0	3.1	6.3	−2.4
70	1.2	3.2	5.5	− .2
75	.8	2.7	5.2	− .5
80	1.0	3.1	3.2	− .6
85	.9	1.7	3.1	− .3
90	.6	.9	2.6	− .4
95	.4	.4	1.6	.1

sixteen years, results were figured separately for the first (X_1) and the second (X_2) groups of school girls at sixteen years in the nine-place series. The outcome is shown in Table 460. Except for the lowest 10 per cent, differences between the two groups are so small and so inconsistent that one would have to say there is no difference. The median difference is 0.7 per cent in favor of the first group. Since the yearly differences in the school group from fifteen to seventeen are 6.9 and 6.7 per cent, we are justified in concluding that the introduction of the new group has not vitiated the yearly comparisons. The comparison of X_1 and X_2 girls at sixteen years in the seven-place series showed a difference of less than .5 per cent in favor of the X_2 group, except for the ten percentile where the X_2 group stood 4.7 ahead of the X_1 group.

The yearly differences between the percentile scales of the entire group of girls in memory, for seven-, eight-, and nine-place series and for the sum of the three, are presented in Tables 461 and 462. The corresponding differences for school girls (X) and working girls (M) separately are presented in Tables 463 and 464. The size of the differences and the general course of events is similar to that for the boys. For the seven-place series a definite gain occurs only in year fourteen to fifteen. In the eight- and nine-place series definite gains are shown up to year seventeen. Year sixteen to

TABLE 462

MEMORY — SUM OF THE 7-, 8-, AND 9-PLACE SERIES: YEARLY DIFFERENCES BETWEEN THE FIVE-PERCENTILE SCALES

Girls

PERCENTILES	15–14	16–15	17–16	18–17
5	17	21	−5	9
10	14	21	−5	10
15	11	21	−2	9
20	9	24	−3	12
25	8	24	1	9
30	9	21	4	7
35	9	21	4	6
40	9	20	4	5
45	9	19	5	4
50	10	16	6	4
55	10	15	6	4
60	10	14	5	3
65	9	14	4	2
70	9	12	4	1
75	9	10	4	1
80	9	7	5	1
85	6	6	7	1
90	4	9	2	0
95	6	.0	.0	.0

TABLE 463

MEMORY: YEARLY DIFFERENCES IN PER CENT OF ACCURACY BETWEEN THE TEN-PERCENTILE SCALES

Girls

7-Place Series

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	5.1	2.5	.1	−2.6	9.7	5.3	−7.8	2.9
20	6.7	3.1	1.4	− .7	10.2	3.1	−5.8	5.5
30	4.0	1.1	2.9	−2.3	4.2	3.1	−2.2	1.1
40	3.5	− .4	1.9	−1.9	4.1	2.6	−1.9	− .6
50	2.6	−1.1	1.9	−1.9	4.0	.7	− .5	−1.6
60	1.4	− .5	1.0	−1.1	2.9	.5	− .4	−1.7
70	.9	− .6	1.0	−1.0	1.9	.3	− .3	−1.2
80	.7	− .9	.8	− .8	1.1	.9	− .7	− .9
90	.4	− .4	.1	− .1	.5	.1	− .1	−1.0

8-Place Series

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	7.4	6.5	5.0	6.5	4.7	8.0	4.5	1.3
20	1.9	9.2	8.3	−1.4	7.3	7.2	−.5	.3
30	2.4	11.4	5.4	.9	3.7	9.9	−.8	3.0
40	7.5	8.2	2.2	1.4	4.7	9.4	−1.0	3.4
50	6.4	3.8	2.7	.4	4.8	7.9	−.4	1.3
60	3.7	2.9	2.3	.2	5.0	5.0	−1.0	1.3
70	3.9	.0	1.3	− .1	3.4	2.6	−.6	.6
80	2.4	−.4	1.1	.1	1.7	2.2	−.5	−.1
90	1.1	−.2	.3	.4	.8	1.3	−.5	−.6

9-Place Series

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	.8	7.2	5.5	3.6	4.1	3.1	− .1	7.2
20	1.3	7.0	2.0	7.5	6.0	3.4	2.6	4.7
30	.1	8.1	5.9	3.0	2.3	6.3	2.7	3.1
40	−.8	7.0	7.5	2.2	1.8	7.1	2.1	3.4
50	.2	6.9	6.7	.0	3.3	5.9	4.5	.7
60	−.5	6.3	5.1	.3	4.9	4.9	4.5	.0
70	.4	4.6	4.5	.8	4.8	3.4	5.0	−1.1
80	1.9	2.4	3.1	.2	1.2	2.7	4.4	− .5
90	.5	.9	2.1	.1	.3	2.0	2.4	− .5

TABLE 464

MEMORY — SUM OF 7-, 8-, AND 9-PLACE SERIES: YEARLY DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES

Girls

Percentiles	X				M			
	15–14	16–15	17–16	18–17	15–14	16–15	17–16	18–17
10	7	14	7	8	19	17	−6	15
20	7	25	9	7	14	20	−5	14
30	8	22	10	8	13	19	−2	12
40	10	17	11	5	12	17	2	8
50	8	17	8	4	15	14	2	6
60	10	14	5	3	13	12	3	7
70	10	10	3	8	10	13	4	2
80	7	8	7	2	10	7	4	1
90	6	6	0	0	3	6	7	0

TABLE 465

SENTENCES — INDEX OF IDEAS: YEARLY DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Boys

Percentiles	15–14	16–15
5	2.3	+.2
10	1.1	.5
15	1.2	.2
20	1.1	.2
25	1.4	.4
30	1.4	.3
35	1.6	.1
40	1.4	.3
45	1.3	.3
50	1.2	.2
55	1.3	.2
60	1.3	.1
65	1.1	.2
70	1.1	.2
75	.9	.3
80	.9	.3
85	.8	.3
90	.7	.5
95	.2	.6

seventeen shows large gains in the nine-place series, but only small ones in the eight-place series. It is roughly true to say of the girls, as of the boys, that adult capacity is reached for the seven-place series at fifteen, for the eight-place series at sixteen, and for the nine-place series at seventeen. In the case of girls a very slight gain occurs in the eight- and nine-place series, lower half of the scale, up to eighteen years. Indeed, the entire gain in memory above the sixteen-year limit is greater for girls than for boys.

The corresponding differences for school girls and working girls show a situation similar to that of the boys. In the seven-place series, school girls show no consistent gain after fifteen years while working girls continue to gain up to sixteen years. In the eight-place series, school girls continue to gain up to seventeen years while working girls reach their limit at sixteen years. In the nine-place series, both groups continue to gain up to seventeen years, and in the lower half of the scale up to eighteen years, but the gains above sixteen years are larger for school than for working girls. Working girls, like working boys, show little gain in memory after sixteen years, while school girls show consistent gains up to seventeen years. Beyond seventeen years, both groups show gain in the lower part of the scale. The poorest members of both groups seem to keep on gaining up to eighteen years.

SENTENCE COMPLETION

The test of completion of sentences furnishes a comparison of the years from fourteen to sixteen only. The yearly differences in terms of index of ideas are given in Table 465 for the whole group of boys, and in Table 466 for the school (X) and working (M) boys separately. There is a gain in index both years. Between fourteen and fifteen the gain is between one and two seconds, but between fifteen and sixteen, less than half a second. A comparison of school and working boys shows that the gain is due largely to the school boys. Between fourteen and fifteen the school boys gain about two seconds, and the working boys about half a second. Between fifteen and sixteen there is no gain for the working group, and only a very small one—less than half a second—for the school group.

The yearly differences in terms of the number of sentences begun with an association time of two seconds or less is given in Table 467 for the entire group of boys, and in Tables 468 for school (X) and working (M) boys separately. There is a small gain in association time between fourteen and fifteen, but none between fifteen and sixteen. A comparison of school and working boys shows that what gain there is, is due to the school boys.

The number of correct sentences offers a poor basis of comparison because so many of both groups had all of them correct. The yearly differences are presented for the whole group in Table 469, and for school (X) and working (M) boys separately in Table 470. The difference is small from

TABLE 466

SENTENCES — INDEX OF IDEAS: YEARLY DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Boys

Percentiles	X		M	
	15–14	16–15	15–14	16–15
10	2.7	1.4	.3	.5
20	3.2	.6	.8	.0
30	2.9	.2	1.1	−.7
40	2.4	.1	.7	−.3
50	2.0	.2	.6	−.4
60	1.6	.3	.4	−.1
70	1.3	.4	.4	.2
80	1.0	.4	.9	−.1
90	.7	.6	.4	.2

TABLE 467

SENTENCES — NUMBER BEGUN IN TWO SECONDS OR LESS: YEARLY DIFFERENCES BETWEEN THE FIVE-PERCENTILE SCALES

Boys

Percentiles	15–14	16–15
5	0	0
10	0	.4
15	.1	.6
20	.5	.3
25	.8	.3
30	1.2	−.1
35	1.5	−.3
40	1.6	−.4
45	1.6	−.1
50	1.6	−.5
55	1.6	−.3
60	1.7	−.3
65	1.6	0
70	1.5	.4
75	1.4	.5
80	1.3	.8
85	1.1	.9
90	.9	1.0
95	.5	.9

TABLE 468

SENTENCES — NUMBER BEGUN IN TWO SECONDS OR LESS: YEARLY DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES

Boys

Percentiles	X		M	
	15–14	16–15	15–14	16–15
10	.9	.3	−.8	0
20	1.8	−.3	−.2	− .3
30	2.5	−.7	.3	− .5
40	2.6	−.7	.2	− .9
50	2.5	0	.8	−1.1
60	2.3	.8	1.0	−1.2
70	1.8	1.1	1.2	−1.3
80	1.4	1.2	1.0	− .8
90	.9	1.1	.7	− .4

TABLE 469

SENTENCES — NUMBER CORRECT: YEARLY DIFFERENCES BETWEEN THE FIVE-PERCENTILE SCALES

Boys

Percentiles	15–14	16–15
5	1.1	.3
10	1.3	.3
15	1.2	.3
20	1.2	.3
25	1.1	.2
30	.9	.2
35	.7	.3
40	.7	.1
45	.6	.1
50	.5	.1
55	.3	.1
60	.3	.1
65	.3	.0
70	.2	.0
75	.2	.0
80	.2	.0
85	.1	.1
90	.0	.0
95	.0	.0

TABLE 470

SENTENCES — NUMBER CORRECT: YEARLY DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES

Boys

Percentiles	X		M	
	15–14	16–15	15–14	16–15
10	.7	.6	1.5	−.8
20	.4	.2	1.6	−.6
30	.4	.2	1.5	−.3
40	.2	.1	1.3	−.3
50	.1	.1	1.1	−.3
60	.1	.0	.8	−.1
70	.0	.1	.6	−.1
80	.1	.0	.4	−.1
90	.0	.1	.2	.0

TABLE 471

SENTENCES — NUMBER OF IDEAS: YEARLY DIFFERENCES BETWEEN THE FIVE-PERCENTILE SCALES

Boys

Percentiles	15–14	16–15
5	1.3	.1
10	1.7	.2
15	2.1	−.1
20	2.3	−.2
25	2.4	−.2
30	2.6	−.2
35	2.7	−.1
40	2.5	0
45	2.3	.5
50	2.0	.7
55	1.7	.8
60	1.5	1.0
65	1.7	.7
70	1.8	.5
75	1.6	.7
80	1.3	.5
85	1.5	.4
90	1.6	.3
95	.4	1.6

TABLE 472

SENTENCES — NUMBER OF IDEAS: YEARLY DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES

Boys

Percentiles	X		M	
	15–14	16–15	15–14	16–15
10	− .5	2.6	1.4	− .4
20	− .4	2.0	3.6	−1.0
30	− .6	2.2	4.3	−1.3
40	−1.4	2.8	5.0	− .9
50	−1.0	3.3	5.3	− .5
60	−1.6	3.3	5.3	− .1
70	−1.6	3.5	5.4	− .4
80	−1.1	2.9	5.8	− .9
90	−1.4	4.6	6.8	−1.2

TABLE 473

SENTENCES — INDEX OF IDEAS: YEARLY DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Girls

Percentiles	15–14	16–15
5	.2	2.5
10	.5	1.3
15	1.0	1.4
20	1.3	1.1
25	1.6	.7
30	1.5	.9
35	1.6	.5
40	1.5	.7
45	1.4	.7
50	1.4	.7
55	1.4	.6
60	1.2	.6
65	1.1	.6
70	1.1	.6
75	1.0	.5
80	.9	.6
85	.9	.6
90	.6	.8
95	.1	1.0

TABLE 474

SENTENCES — INDEX OF IDEAS: YEARLY DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Girls

Percentiles	X		M	
	15–14	16–15	15–14	16–15
10	4.1	2.8	−1.4	1.0
20	3.7	1.4	−1.0	.8
30	2.7	1.4	.8	.0
40	2.6	.8	1.0	.1
50	2.1	.9	.5	.3
60	1.8	.6	.3	.4
70	1.5	.5	.3	.4
80	1.0	.7	.3	.4
90	.6	.8	.3	−.3

TABLE 475

SENTENCES — NUMBER BEGUN IN TWO SECONDS OR LESS: YEARLY DIFFERENCES BETWEEN THE FIVE-PERCENTILE SCALES

Girls

Percentiles	15–14	16–15
5	.0	.0
10	−.3	.8
15	−.3	1.4
20	−.3	1.4
25	−.3	1.5
30	−.4	1.4
35	−.2	1.5
40	.3	1.1
45	.4	1.1
50	.4	1.2
55	.4	1.2
60	.4	1.4
65	.6	1.5
70	.7	1.6
75	.8	1.3
80	1.1	1.0
85	1.1	.7
90	.9	.8
95	.6	.9

fourteen to fifteen and negligible from fifteen to sixteen. Among school boys no improvement is present in either year except at the lower end of the scale. Among working boys there is a gain from fourteen to fifteen, but a slight loss from fifteen to sixteen. There is little improvement above the fourteen-year record in this test. In index of ideas and association time, which seem to furnish the best measures, there is no gain above fourteen for working boys and none above fifteen for school boys.

Measured in terms of number of ideas, the results are presented in Table 471 for the entire group of boys, and in Table 472 for school and working (M) boys separately. There is a small gain from fourteen to fifteen, but none from fifteen to sixteen. The working and school boys reacted quite differently. At fifteen, school boys wrote short sentences and wrote them rapidly. Since so many tests were timed, they transferred the idea of speed to this test also, though speed was not mentioned. Accordingly the tables show a gain in index, but a loss in number of ideas. The working boys made no such interpretation and wrote longer sentences at fifteen than they had at fourteen. There is no change in the record of the working boys from fifteen to sixteen, but the school boys seemed less obsessed with the idea of speed and wrote longer sentences at sixteen than they had at fifteen.

The yearly differences for girls in index of ideas in the sentence test are given in Table 473 for the entire group, and in Table 474 for school (X) and working (M) girls separately. The relationship is similar to that of the boys. There is a significant gain between fourteen and fifteen (about a second and a half), and a smaller one (about three-fourths of a second) between fifteen and sixteen. The gain is due almost entirely to the school girls in both years.

The yearly differences in association time are given in Table 475 for the entire group of girls, and in Table 476 for school (X) and working (M) girls separately. In this measure, results differ from those of the boys. There is a very small and irregular gain from fourteen to fifteen, and a larger one from fifteen to sixteen. Both groups of girls gain more from fifteen to sixteen than from fourteen to fifteen, and it is the working girls who gain most.

The yearly differences for number of sentences correct are given in Table 477 for the entire group of girls, and in Table 478 for school (X) and working (M) girls separately. The gains from year to year are very small—as in the case of the boys. They are present during both years of the test, and for both school (X) and working (M) girls.

The results for number of ideas are given in Table 479 for the entire group of girls, and in Table 480 for school (X) and working (M) girls separately. Girls gain during both years in number of ideas, but they gain more from fifteen to sixteen than from fourteen to fifteen. School girls,

TABLE 476

SENTENCES — NUMBER BEGUN IN TWO SECONDS OR LESS: YEARLY DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES

Girls

Percentiles	X		M	
	15–14	16–15	15–14	16–15
10	.4	1.1	−.6	.7
20	.4	1.1	−.7	1.4
30	.5	1.1	−.9	2.1
40	.6	.8	−.7	2.5
50	.3	.5	.2	1.8
60	.9	1.0	.3	2.0
70	1.1	.6	.2	2.3
80	1.1	.2	.3	2.4
90	.7	.8	.9	1.5

TABLE 477

SENTENCES — NUMBER CORRECT: YEARLY DIFFERENCES BETWEEN THE FIVE-PERCENTILE SCALES

Girls

Percentiles	15–14	16–15
5	.5	1.1
10	1.1	.8
15	1.1	.7
20	1.1	.4
25	1.0	.4
30	.8	.5
35	.7	.4
40	.7	.2
45	.6	.2
50	.5	.2
55	.4	.2
60	.3	.1
65	.3	.1
70	.3	.1
75	.2	.0
80	.1	.1
85	.1	.1
90	.1	.1
95	.0	.0

TABLE 478 — SENTENCES — NUMBER CORRECT: YEARLY DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES

Girls

Percentiles	X		M	
	15–14	16–15	15–14	16–15
10	.5	.7	.5	1.0
20	.5	.5	1.1	.5
30	.7	.1	1.4	.2
40	.4	.1	1.0	.3
50	.2	.1	.7	.2
60	.2	.1	.7	.1
70	.2	.0	.5	.0
80	.1	.0	.5	.0
90	.1	.0	.3	−.1

like the school boys, lose in number of ideas between fourteen and fifteen because they carried over the idea of speed from other tests so strongly that they wrote short sentences. The working girls, like the working boys, failed to make such an interpretation of the situation, and wrote longer sentences at fifteen than they had at fourteen. At sixteen the school girls were less dominated by ideas of speed and again wrote longer sentences.

Girls continue to improve in the various measures of the sentence test longer than boys. There is improvement up to sixteen for both groups of girls, and it is, on the whole, as marked for working as for school girls.

Correlations from Year to Year

The studies of growth presented in this chapter have all been based upon summaries of the entire group, not upon studies of individual gains and losses. It is interesting and important to know whether the individuals composing the group remained in the same relative position to one another from year to year, or whether they shifted relative positions markedly. Correlations of the average percentile rank of one year with that of the next furnish information on this point. The correlations are presented in Table 481.

The correlations show a fairly high degree of constancy in the records from year to year. The smallest correlation is .57 and the largest .83. There are two points of special interest. The correlations of the first two years are significantly smaller than those of the last two years. Those of the first two years vary from .57 to .76—most of these fall between .60 and .70. The correlations of the last two years vary from .63 to .83, and most of these fall from .75 to .80. This statement is equally true for the physical tests, which were the same from year to year and for the mental tests, which were considerably varied from year to year. It seems necessary,

TABLE 479

SENTENCES — NUMBER OF IDEAS: YEARLY DIFFERENCES BETWEEN THE FIVE-PERCENTILE SCALES

Girls

Percentiles	15–14	16–15
5	1.1	1.2
10	2.0	1.2
15	1.2	1.6
20	1.8	2.0
25	1.1	1.8
30	1.7	1.8
35	1.0	1.9
40	1.7	1.9
45	1.7	2.0
50	1.9	1.9
55	1.7	2.2
60	1.4	2.4
65	1.8	2.3
70	3.0	2.4
75	2.9	2.5
80	3.0	2.9
85	1.2	2.8
90	.8	3.1
95	1.8	2.8

TABLE 480

SENTENCES — NUMBER OF IDEAS: YEARLY DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES

Girls

Percentiles	X		M	
	15–14	16–15	15–14	16–15
10	− .8	4.1	1.5	.5
20	−1.2	4.3	3.5	.2
30	− .8	4.4	3.8	.3
40	−2.0	4.7	4.6	.2
50	−2.6	5.4	5.2	.1
60	−2.8	5.7	5.8	.1
70	−2.1	5.2	6.0	.2
80	−1.6	5.1	5.1	.4
90	.3	3.3	5.4	1.2

TABLE 481

CORRELATIONS OF THE AVERAGE PERCENTILE RANK OF ONE YEAR WITH THAT OF THE NEXT

SERIES M

YEAR	PHYSICAL TESTS		MENTAL TESTS	
	Boys	Girls	Boys	Girls
14 with 15	.69	.58	.67	.63
15 with 16	.66	.65	.76	.57
16 with 17	.77	.71	.76	.63
17 with 18	.81	.80	.79	.83

therefore, to attribute the tendency to the greater constancy of those who have reached an approximately adult level of performance.

The table indicates a sex difference in stability. The correlations, with the single exception of mental tests from seventeen to eighteen, are higher for boys than for girls in both mental and physical series. This remains true in spite of the fact that girls are nearer maturity than boys at these ages, and might, therefore, be expected to display a higher degree of constancy from year to year. We seem forced to conclude that girls show a greater variation in performance from year to year than boys.

In comparing correlations of physical tests with those of mental tests, no marked trends appear. Of the eight possible comparisons of mental and physical series, the physical has the higher correlation five times and the mental three. The largest difference in correlation between the two series is ten points in favor of the mental among boys from fifteen to sixteen years. In most instances the two correlations differ by five points or less. Our conclusion is that constancy from year to year is about the same for mental and for physical tests.

SUMMARY OF CHAPTER VI

I. The rate of growth, physical and mental, is related to various factors. Not merely age, but sex, degree of ability, and type of measurement, all play a part. General statements with regard to growth must accordingly be made with reference to these various conditions, a point which has been wisely emphasized by Freeman (1).

II. *Growth from fourteen to eighteen as related to sex.*

In physical measures, girls mature earlier than boys. Not only is this true in height and weight, but also in vital capacity, strength of the hand, steadiness, rapidity of motion, and eye-hand coördination as displayed in card-sorting. In most physical measures, boys continue to gain rapidly from year to year up to seventeen, and more slowly up to eighteen. Card-sorting—the one test in which girls excel them—is the only one which does not improve beyond seventeen. In most physical measures girls complete their period of rapid growth by fifteen or sixteen and gain very little after seventeen. In steadiness, in endurance in speed, and in card-sorting, girls keep on making very small gains up to eighteen. We can say then, that in fundamental physical capacities girls reach a status which is approximately that of the adult from one to two years earlier than boys. The earlier physical maturity of girls in size, vital capacity, and strength has been amply established by many workers. Summaries and bibliographies on this point are to be found in Baldwin's work (2) and in Whipple's (3).

In mental measures no such sex difference appears. Boys and girls are closely comparable in their yearly gains in the few tests for which we have records.

Our results give us no data for setting a limit in years to mental development for either sex. The tests for which we have yearly records are too few and the apparent limits of mental development too closely related to the type and difficulty of the task to allow of any general statement of limits. The memory and substitution tests suggest that in comparatively simple and routine mental processes both sexes reach maturity at sixteen or seventeen years.

Very little real experimental evidence about the limits of mental development has been offered up to this time. Most studies of mental development have been based upon school children. As soon as the school-leaving age is reached (in most instances fourteen years) school children become a more and more highly selected lot. Standards based upon them cannot be taken as representative of the community. Murdock and Sullivan (4), in a study of school children, claim to have proof of periods of rapid mental growth corresponding to known periods of rapid physical growth in preadolescent years, occurring about two years earlier for girls than for boys. Their data are based on mental-age scales and are not well-adapted for showing mental development from year to year. Since they are based on school children only, results above fourteen years could not be accepted in any case. Toops and Pintner (5), from a study of the results of a survey made with group mental tests, and from other data, are inclined to think that average mental growth ceases at about fourteen or fifteen years, and that increases occurring after that are so slight that they cannot be measured with the rough scales of intelligence that we possess at the present time. Ballard (6) attempted to measure the limit of the growth of intelligence by the use of graded absurdities, a type of test which he considered particularly well-fitted to test intelligence, independently of mere information. He included some groups of continuation-school and night-school pupils in his series with elementary- and secondary-school children, in the attempt to secure an unselected lot of subjects. His general conclusion was that sixteen years was not the average age at which mental growth ceased, but rather an upper limit. He believed the average age of the cessation of mental growth to be below sixteen. Our results show that even in simple routine processes improvement goes on up to sixteen or seventeen years. The possibility that our tests were affected by practice must be considered. It seems improbable that a single performance of a routine test, at intervals of a year, could constitute practice. We found that our unpracticed sixteen-year-old school children performed these tests with approximately the same degree of proficiency as the sixteen-year-olds who had had the same tests on the two previous years. If we may thus rule out the effect of practice, our series indicates that sixteen or seventeen is a more probable upper limit of mental growth than fourteen or fifteen. Furthermore, this limit applies to simple routine processes and would probably be greater for more difficult tasks.

There is a suggestion that the sex which excels in a given type of test tends to keep on improving in it longer than the other, though the data cannot be regarded as adequate to the final establishment of this point. It is suggestive that in card-sorting (the records of which are more closely comparable to the mental than to the physical series), in memory, and in the copying part of the substitution test—measures in which girls excel boys—girls also continue to gain longer than boys. In all of the physical measures in which boys excel, they continue to gain longer than girls. It is unfortunate that in the type of mental tests in which boys excel—the construction puzzles, puzzle boxes, and recognition tests – no comparisons from year to year are possible.

III. *Growth from fourteen to eighteen as related to ability.*

In physical abilities it is clear that superior children reach a state of approximate maturity a year or two earlier than inferior ones. The tendency is most marked in comparing the records of working boys and school boys. While school boys complete their years of rapid growth at sixteen, working boys continue up to seventeen in most measures. Girls are too near maturity at fourteen to display this tendency clearly between the ages of fourteen and eighteen—similar studies covering the years from eleven to fourteen would probably show the same law. Not only the study of working and school groups but the comparison of the rate of gain in the upper and lower halves of the percentile scales shows this phenomenon of the belated physical development of inferior children. Their belated growth, however, never brings these children up to the standard reached earlier by the superior. The phenomenon of the belated period of rapid physical growth in children of inferior physical status has been amply studied by Baldwin (2). This law seems to apply to the entire series of measurements of physical abilities.

The mental tests furnish little satisfactory evidence about laws of growth as related to ability. In routine processes of a simple type there is some indication of the same belated period of rapid mental development among the inferior as in the case of the physical tests. In cancellation, in seven-place memory, and in the copying part of the substitution test, the tendency is present both among boys and among girls. Unfortunately the tests demanding logical reactions do not lend themselves to repetition from year to year and furnish no evidence on this point. Although there is evidence for a belated period of rapid growth in mental powers among the inferior, it is nevertheless true that the superior keep on making small yearly gains longer than the inferior and by eighteen years are more superior than they were at fourteen. Not only is this shown by the consecutive records of the same test, but also by the percentile ratings from year to year. The average percentile ranks of school children, boys and girls, are more superior to those of working children at eighteen years than they were at fourteen years (see Chapter V). The average percentile rank itself cannot be used as a basis of direct comparison from year to year because it states only relative positions within each yearly series, not the absolute values represented.

While it is true that this study and many previous ones, summed up by Baldwin ([2] p. 236), have shown a positive correlation between physical measurements and mental measurements, nevertheless the relationship is not an exceedingly close one and evidently is not of such a nature as to make the growth periods correspond in the two series. The clear instances of rapid advance in physical measures at certain periods are not necessarily matched by a corresponding rapid advance in mental measurements.

IV. *Laws of growth as related to the type of measurement.*

It is in general true—as one would expect—that the easier the mental task, the earlier an approximately adult status is reached. Thus in memory an adult status is attained for the seven-place series at fifteen, for the eight-place at sixteen, and for the nine-place at seventeen years. In the sentence test comparatively small gains are made beyond fourteen. The test was so easy that an approximately adult status was attained at fourteen. It seems to be true, too, that the harder the mental task is on a first trial, the greater the improvement in a second trial—doubtless because there is so much more room for improvement. When the Healy and Fernald puzzle box was repeated at sixteen years, the working children made more of a gain than the school children (see Chapter V). However, on the first trial their record had been very much below that of the school children. The same thing is true of the seventeen- and eighteen-year trials of the mutilated-text test. In both cases the working group remained very inferior to the school group in spite of their greater gain. The superior group seemed to be able to perform the test on a first trial with a degree of perfection much nearer that of their ultimate capacity than the inferior group.

Tests of the type we have been discussing—those involving logical thinking—are doubtless more affected by a previous performance than are the more routine types of tests such as memory or substitution. Perhaps even one performance in such a test has the effect of practice. In any case it is interesting to note that the way in which the upper and lower levels of ability reacted to a second performance of these tests is similar to their response to practice in a test of physical skill reported by Johnson (7). The lower levels of ability (if above the level of defect) gained more through practice than the upper level, though the inferior never equaled the record of the superior. Thus the nature of the tests makes it much more possible to secure evidence about the rate of physical growth than evidence about the rate of mental growth.

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(3) Whipple, Guy M.—*Manual of Mental and Physical Tests.* Baltimore: Warwick & York, 1914.

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(6) Ballard, P. B.—"The Limit of Growth of Intelligence," British *Journal of Psychology*, 1921, xii, 125–141.

(7) Johnson, Buford—"Practice Effects in a Target Test: a Comparative Study of Groups of Varying Intelligence," *Psychological Review*, 1919, xxvi, 300–316.

CHAPTER VII

DIFFERENCES OF SEX

THE methods of comparing boys and girls is the same as that adopted in Chapter VI for a comparison of one year's records with those of the next. Tables of differences between the five-percentile scales of boys and girls in Chapters III and IV and tables of differences between the ten-percentile scales of boys and girls in Chapter V are presented for each test given. In every case the girls' scale is subtracted from the boys' scale. Thus a positive difference always means superiority on the part of the boys and a negative difference superiority on the part of the girls.

HEIGHT

The sex differences of height for the entire group are shown in Table 482. Those for school children (X) and working children (M) separately are shown in Table 483. The tables show that at fourteen girls as a whole are a trifle taller than boys. By fifteen years boys have surpassed girls in height except at the lower end of the scale. At sixteen, seventeen, and eighteen the difference in favor of the boys is a steadily increasing one. The differences are larger at the upper than at the lower end of the scale. Tall boys have a greater advantage over tall girls than short boys of the same age have over short girls. There is an interesting difference between the school (X) and working (M) groups. School boys and girls are of the same median height at fourteen years. Among the retarded children at the lower end of the scale, girls are ahead, while among the advanced children at the upper end of the scale, boys are ahead. From fifteen on, school boys are increasingly superior to school girls. Among working children, year fourteen shows girls consistently superior to boys. At fifteen the boys have begun to be ahead, but not until sixteen do the working boys gain a consistent and significant advantage. From sixteen to eighteen they gain on the girls rapidly. From fifteen on, school boys show decidedly more superiority to school girls than working boys do to working girls. This is another expression of the fact brought out in Chapter V, that school boys are much more superior to working boys than school girls are to working girls.

WEIGHT

The comparison of boys and girls in weight is shown in Table 484 for the entire group, and in Table 485 for school children (X) and working children (M) separately. Weight follows similar lines to height. Boys gain a clear

TABLE 482

HEIGHT: SEX DIFFERENCES IN CENTIMETERS BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	−3.3	−2.0	2.7	7.8	8.9
10	−3.2	−1.1	3.6	8.0	9.5
15	−3.2	− .8	4.1	8.8	9.2
20	−2.9	− .1	4.3	8.2	9.4
25	−2.8	.4	4.5	8.4	9.6
30	−2.7	1.0	5.1	8.5	9.7
35	−2.7	1.2	5.3	8.6	9.5
40	−2.4	1.5	5.5	8.6	9.4
45	−2.1	1.9	5.6	8.6	9.5
50	−2.0	2.2	5.8	8.8	9.5
55	−1.9	2.6	6.0	8.8	9.7
60	−1.8	3.0	6.2	9.0	9.9
65	−1.5	3.4	6.5	9.0	10.0
70	−1.0	3.5	6.9	9.2	10.0
75	− .5	3.7	7.3	9.1	9.9
80	− .1	4.1	7.4	9.0	10.0
85	.4	4.4	7.6	9.1	10.3
90	.8	4.8	8.1	9.7	10.0
95	2.1	6.8	8.3	9.2	11.0

TABLE 483

HEIGHT: SEX DIFFERENCES IN CENTIMETERS BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	−3.4	−.4	6.0	8.6	11.4	− .7	−1.4	2.4	8.0	9.1
20	−1.7	2.1	6.0	8.7	10.7	−4.0	.1	3.2	8.2	9.3
30	−1.5	2.6	7.4	9.2	9.9	−4.2	− .4	3.7	8.2	9.7
40	− .9	3.7	7.8	9.5	10.0	−4.0	.1	3.9	8.3	9.5
50	0	4.6	7.8	9.7	10.4	−3.7	.8	4.2	8.3	9.5
60	0	5.2	8.9	10.1	11.5	−3.3	.8	4.3	8.3	9.6
70	.5	5.5	9.3	10.2	12.3	−3.1	1.8	4.9	8.4	9.6
80	1.6	6.1	9.2	10.2	12.7	−1.9	2.2	5.2	8.4	9.3
90	4.1	7.2	10.4	11.4	13.4	−1.0	3.0	5.1	9.0	9.4

TABLE 484

WEIGHT: SEX DIFFERENCES IN KILOGRAMS BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

PERCENTILES	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	−2.9	−2.9	−.6	1.6	5.5
10	−2.6	−2.5	.3	3.2	6.9
15	−3.4	−2.5	.8	4.3	7.2
20	−2.9	−2.0	.9	4.6	7.0
25	−3.0	−2.1	1.3	4.8	6.9
30	−3.2	−2.0	1.8	4.8	6.8
35	−3.2	−1.6	2.0	4.5	6.8
40	−3.3	−1.2	2.3	4.4	6.8
45	−3.2	− .9	2.6	4.6	6.7
50—	−3.3	− .6	2.8	4.6	6.5
55	−3.2	− .2	2.9	4.5	6.6
60	−3.0	0	3.0	4.7	6.6
65	−2.9	.2	3.1	4.6	6.8
70	−2.8	.3	2.9	4.3	6 9
75	−2.2	.5	2.7	4.0	7.0
80	−2.3	.3	3.0	4.1	7.4
85	−2.0	.1	3.6	3.9	6.6
90	−1.2	− .1	2.6	3.3	5.7
95	− .8	−2.1	1.7	1.2	1.6

TABLE 485

WEIGHT: SEX DIFFERENCES IN KILOGRAMS BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	−2.4	−1.8	2.9	4.6	10.6	−2.9	−2.6	− .9	2.7	6.0
20	−2.3	.1	2.5	5.8	9.9	−3.4	−3 6	− .4	4.3	6.6
30	−2.4	.1	3.5	5.9	8.7	−3.4	−3 0	.4	4.0	6.3
40	−2.1	1.6	4.3	6.3	8.9	−3.8	−2.4	1.2	3.7	6.4
50	−2.0	2.2	4.6	6.4	9 0	−4.2	−2.0	1.3	3.6	6.0
60	−1.8	2.2	4.8	6.8	10.4	−4.5	−1.8	1.2	3.4	6.1
70	−1.0	2.1	4.7	7.3	10.1	−4.4	−1.7	.9	3.0	6.3
80	− .4	3.1	5.2	7.1.	10.5	−4.4	−1.4	.6	2.5	6.4
90	1.0	2.2	4.2	5.3	6.7	−3.6	− .8	.7	2.2	6.0

superiority over girls in weight a year later than they do in height. At fifteen, girls are still slightly superior in weight though not in height. At sixteen, boys are clearly ahead in weight, and are increasingly so up to eighteen. The school and working groups show the same type of contrast as in height. School girls lose their lead in weight over school boys at fifteen years, whereas working girls do not lose it until sixteen years. In the case of weight, the degree of difference is about the same in the upper and lower portions of the scale. In other words, there is as much difference between light girls and light boys as there is between heavy girls and heavy boys. Since in height the advantage of the boys is an increasing one as the scale is ascended, it must be true that girls at these ages have a tendency to be heavier in proportion to their height than boys.

Vital Capacity

In vital capacity, the superiority of the boys is marked at all ages (Table 486), even at fourteen and fifteen, when their superiority in height and weight is not clearly established. The boys are increasingly superior to the girls up to seventeen years. The sex difference at eighteen is only slightly in excess of that at seventeen. A comparison of the sex differences in the school group with those in the working group (Table 487) shows that school boys are throughout more superior to school girls than working boys are to working girls.

Strength of the Hand

In strength of the hand (Table 488) boys are also clearly superior to girls at each age from fourteen to eighteen, in spite of their inferiority in size at fourteen. The amount of difference is similar for the two hands and increases rapidly from year to year. While the median difference is only about 2 kilograms at fourteen years, it is 16 kilograms at eighteen years. The differences for school (X) and working (M) children separately (Table 489) show again a greater superiority of school boys over school girls than of working boys over working girls.

A comparison of records for right and left hands shows that at fourteen and fifteen the superiority of the boys with the left hand is slightly greater than with the right. From sixteen on, superiority is greater with the right hand. This shift from greater superiority with the left hand to greater superiority with the right hand is due chiefly to the working group. It is interesting to note also that greater superiority with the left hand is more marked in the lower than in the upper half of the scale among both groups.

The conclusion seems to be that relatively good left-hand development in strength is more frequently present in inferior boys than among girls or superior boys. The facts about the proportion of actual superiority with the left hand bear out this conclusion. Left-handedness in strength is

TABLE 486

VITAL CAPACITY: SEX DIFFERENCES IN CUBIC CENTIMETERS BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	255	225	439	908	1002
10	242	234	480	953	977
15	212	256	497	960	973
20	201	263	549	933	967
25	209	282	676	923	961
30	218	308	603	948	973
35	235	351	632	996	1014
40	232	400	663	1043	1052
45	237	440	697	1079	1083
50	243	457	736	1116	1120
55	253	473	770	1150	1153
60	268	487	787	1184	1186
65	289	499	804	1224	1228
70	310	506	826	1272	1281
75	343	537	856	1304	1318
80	376	564	889	1314	1346
85	405	605	952	1387	1378
90	468	666	1002	1352	1440
95	627	739	1045	1503	1456

TABLE 487

VITAL CAPACITY: SEX DIFFERENCES IN CUBIC CENTIMETERS BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	166	243	434	696	1227	311	21	432	750	937
20	206	289	674	820	1103	241	237	481	830	955
30	290	412	731	915	1291	212	296	537	829	969
40	245	479	774	1006	1303	223	342	565	904	1026
50	267	529	817	1079	1327	231	424	619	950	1082
60	306	584	860	1076	1359	233	459	698	1014	1153
70	359	627	908	1134	1394	266	467	749	1064	1252
80	575	693	1008	1314	1410	322	461	766	1013	1347
90	757	873	1097	1319	1390	349	526	851	1120	1440

TABLE 488

STRENGTH OF THE HAND: SEX DIFFERENCES IN KILOGRAMS BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	Right Hand					Left Hand				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	1.8	2.3	4.1	8.4	11.3	1.5	2.8	3.9	8.7	11.9
10	1.1	3.2	4.9	9.2	13.5	1.7	2.9	5.0	9.1	12.6
15	1.4	2.0	6.1	10.3	14.5	1.4	2.8	5.9	10.0	13.0
20	1.8	2.3	6.6	11.4	14.7	1.7	3.0	6.3	10.9	13.5
25	2.0	2.5	6.9	12.2	15.0	2.0	3.1	7.1	11.5	14.0
30	2.1	2.8	7.5	12.7	15.5	2.1	3.3	7.6	11.9	14.4
35	2.3	3.2	7.0	13.0	16.2	2.2	3.7	8.0	12.2	15.1
40	2.2	3.2	8.3	13.4	16.3	2.3	4.2	8.6	12.5	15.6
45	2.0	3.4	8.7	13.9	16.5	2.4	4.4	9.5	12.8	15.8
50	1.8	3.7	9.2	14.2	16.6	2.3	4.6	9.3	13.2	16.2
55	1.9	4.4	9.8	14.9	16.7	2.3	5.1	9.3	13.6	16.3
60	2.1	5.3	10.5	15.5	17.1	2.2	5.6	9.6	13.9	16.4
65	2.2	6.1	11.2	16.1	17.4	2.4	6.2	10.0	14.3	16.5
70	2.5	6.7	11.8	16.7	17.9	2.5	6.8	10.5	14.7	16.9
75	2.6	8.0	12.9	17.5	18.2	2.8	7.3	11.3	15.4	17.2
80	3.0	8.8	13.7	17.7	18.0	3.1	7.8	12.0	16.0	17.6
85	3.3	10.0	14.3	17.6	18.2	3.3	8.6	12.9	16.6	17.9
90	4.3	11.4	15.4	17.5	18.8	3.9	10.0	14.2	17.1	18.2
95	6.5	12.5	16.2	16.9	19.3	6.0	9.8	14.6	17.6	18.7

TABLE 489

STRENGTH OF THE HAND: SEX DIFFERENCES IN KILOGRAMS BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

RIGHT HAND

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	1.7	2.5	5.9	11.5	15.7	2.3	2.3	5.0	7.0	12.6
20	2.2	3.3	8.2	13.3	16.5	1.5	2.0	6.2	8.9	14.8
30	2.1	3.9	9.5	14.0	16.6	1.7	2.5	6.5	11.9	15.4
40	2.3	5.1	10.2	15.0	17.2	2.1	2.8	7.2	12.6	16.6
50	2.6	6.3	11.3	15.8	18.7	2.2	3.0	7.9	13.5	16.9
60	3.1	8.4	12.6	17.2	19.4	1.3	3.2	8.3	14.2	17.3
70	3.5	10.2	13.9	18.1	19.3	1.4	4.6	9.7	15.9	17.8
80	4.4	11.8	15.4	18.3	19.9	1.5	6.3	11.4	17.0	18.8
90	6.6	11.4	17.2	19.0	20.4	2.0	8.0	13.6	17.4	18.8

TABLE 489 — *Continued*

Left Hand

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	1.4	3.4	6.5	11.9	15.2	2.1	2.5	3.9	7.8	11.8
20	2.3	3.3	8.1	12.3	14.4	1.4	2.8	5.6	8.5	13.4
30	2.4	4.7	9.7	13.4	16.4	1.7	3.3	6.6	11.0	14.5
40	2.4	5.4	9.9	13.8	16.3	2.0	3.6	7.4	11.4	15.5
50	2.6	6.3	10.7	14.6	16.9	2.4	4.0	7.9	12.5	15.3
60	2.8	7.4	11.7	15.6	18.8	2.1	4.2	8.6	13.3	16.6
70	3.3	8.4	12.6	16.9	21.8	1.9	5.2	9.0	12.9	16.7
80	4.1	10.0	14.2	17.5	20.2	2.4	6.6	9.4	14.8	17.0
90	6.4	11.3	15.9	18.4	20.2	1.6	8.0	11.3	16.2	17.8

TABLE 490

LEFT-HANDEDNESS IN STRENGTH

Age	Boys		Girls	
	No. of Cases	Per Cent	No. of Cases	Per Cent
14	218	26	131	20
15	108	19	69	15
16	127	21	89	18
17	82	18	67	19
18	54	17	30	15

much more frequent among working boys and girls than among school boys and girls (see Chapter V, Strength of the Hand). Left-handedness in strength is also more frequent among boys than among girls. The percentage of left-handedness in this measure for the various years is shown in Table 490.

Steadiness of the Hand

The differences between the percentile scales for girls and boys in terms of number of contacts are given in Table 491 for the entire group, and in Table 492 for school children (X) and working children (M) separately. In this instance, girls are superior at fourteen and fifteen years with the right hand, and at fourteen, fifteen, and sixteen with the left. At seventeen and eighteen, boys as a whole are superior, though there is a tendency for the most superior people to be girls even up to eighteen years. At no year do boys surpass girls in the top five-percentile.

TABLE 491

STEADINESS OF THE HAND: SEX DIFFERENCES IN NUMBER OF CONTACTS BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	Right Hand					Left Hand				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	−5	−7	−5	1	8	−2	−5	−1	3	10
10	−3	−6	−2	1	4	−4	−3	−4	1	3
15	−4	−3	−3	2	3	−4	−4	−9	1	5
20	−4	−4	−3	3	6	−3	−5	−8	1	10
25	−4	−4	0	9	2	−3	−6	−3	1	9
30	−4	−5	0	6	3	−3	−5	−2	7	5
35	−4	−6	1	1	3	−4	−4	−3	3	5
40	−4	−7	7	2	8	−4	−4	−4	2	9
45	−4	−8	1	1	6	−4	−4	−7	2	10
50	−4	−7	1	3	2	−5	−5	−3	9	9
55	−5	−7	0	5	3	−5	−5	−3	8	4
60	−5	−8	1	1	2	−3	−6	−2	2	2
65	−7	−8	1	1	6	−3	−7	−8	1	7
70	−6	−8	0	0	5	−3	−8	−2	1	1
75	−4	−8	0	5	2	−3	−5	−2	2	1
80	−6	−9	0	0	1	−4	−6	−1	0	0
85	−6	−9	−1	0	1	−8	−5	−6	−1	−3
90	−3	−7	−1	−2	0	−6	−4	1	−6	−1
95	−2	−3	−1	−3	0	−2	−7	−1	−5	−8

A comparison of school and working groups shows that in the case of school children, the change from a superiority on the part of girls to a superiority on the part of boys occurs between fifteen and sixteen years, while among working children it occurs a year later, between sixteen and seventeen years. The largest sex difference in the series is the superiority of the girls with the left hand in the year just preceding their loss of lead—fifteen for school girls and sixteen for working girls.

The shift in the case of steadiness from a superiority of the school group in the earlier years to a superiority of the working group in the later years, and from a superiority of girls in the early years to a superiority of boys in the later years, makes it difficult to interpret the right- and left-hand relationships. Left-hand superiority in steadiness is more frequent among working than among school children (see Chapter V, Steadiness). It is slightly more frequent among boys than among girls (Table 493), but not enough so to modify in any consistent way the relative size of the right- and left-hand differences.

TABLE 492

STEADINESS OF THE HAND: SEX DIFFERENCES IN NUMBER OF CONTACTS BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

RIGHT

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	−4	0	4	1	1	−2	−11	−5	7	3
20	−2	− 5	4	2	−1	−4	− 6	− 9	3	3
30	−2	− 3	11	7	−4	−7	− 3	−3	1	2
40	−8	− 7	0	3	0	−2	− 5	−3	1	3
50	−4	− 3	3	1	2	−3	− 8	−2	2	1
60	−3	−10	9	0	5	−3	− 6	−2	1	3
70	−9	− 5	3	1	0	−8	− 8	−8	6	1
80	−2	−11	2	−2	1	−5	−10	0	0	0
90	1	− 2	−3	−1	0	9	− 8	−3	−8	0

LEFT

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	−8	−11	11	8	5	− 3	− 4	−13	1	3
20	−2	− 5	3	3	5	− 1	− 5	− 4	−1	8
30	−5	− 4	3	3	7	− 2	− 8	− 4	1	2
40	−4	−10	3	10	8	− 3	− 6	−10	0	9
50	−1	− 7	2	5	6	− 6	− 4	−11	0	2
60	−2	−11	8	10	4	− 5	− 4	−13	0	7
70	−7	− 6	1	5	8	− 2	− 9	−13	1	− 1
80	−3	−23	0	7	−2	− 1	− 7	−13	3	−10
90	0	−29	2	0	0	−12	−11	−25	5	− 2

TABLE 493

LEFT-HANDEDNESS IN STEADINESS

AGE	BOYS		GIRLS	
	No. of Cases	Per Cent	No. of Cases	Per Cent
14	96	11	67	10
15	57	9	51	10
16	82	13	52	10
17	51	11	44	12
18	46	14	22	11

Rapidity of Movement of the Hand

The differences between the percentile scales of boys and those of girls in rapidity of movement are given in Tables 494 and 495 for the 30- and 60-second records of the entire group, right and left hand. The tables show that boys are superior at every age, and are on the whole increasingly superior from fourteen to eighteen years. The tables show no significant differences in endurance. The 60-second differences are about twice the 30-second differences. The superiority of the boys is very much greater at the upper than at the lower end of the scale. Indeed, there are a few instances of feminine superiority low down in the scale. While there is but a small difference, then, between slow boys and slow girls of a given year, there is a large difference between rapid boys and rapid girls. The difference is greater with the right hand than with the left. The same differences presented separately for school children (X) and working children (M) are found in Table 496 for the 30-second period and in Table 497 for the 60-second period. The chief difference between the tables for school children and those for working children is that school boys are more superior to school girls than working boys are to working girls. The right-hand differences are greater than the left-hand differences.

TABLE 494 — RAPIDITY OF MOVEMENT OF THE HAND: SEX DIFFERENCES IN NUMBER OF TAPS IN 30 SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	Right Hand					Left Hand				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	−2	−1	−1	−1	5	1	5	4	−1	4
10	0	3	1	1	5	0	5	3	0	4
15	0	2	3	3	4	1	2	4	2	5
20	0	3	4	3	3	1	2	5	3	3
25	1	3	4	4	4	1	3	5	3	4
30	2	4	5	4	5	1	4	4	4	5
35	2	4	6	5	4	2	3	5	5	4
40	2	5	7	6	7	1	3	5	5	4
45	3	5	7	5	7	2	3	5	6	5
50	3	6	8	6	8	1	3	5	7	5
55	3	6	8	7	8	2	4	5	6	6
60	4	7	8	8	10	2	3	6	7	6
65	5	8	11	9	10	2	3	7	8	7
70	4	8	9	9	11	1	4	7	8	6
75	4	8	9	9	12	2	4	7	9	7
80	5	8	10	10	12	2	4	9	8	8
85	6	9	12	13	13	3	4	10	9	9
90	6	10	15	14	11	3	6	13	12	10
95	9	17	18	19	11	4	8	16	15	8

TABLE 495

RAPIDITY OF MOVEMENT OF THE HAND: SEX DIFFERENCES IN NUMBER OF TAPS IN 60 SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	Right Hand					Left Hand				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	−7	2	2	−1	7	7	5	10	2	6
10	−1	3	2	1	4	1	2	6	3	9
15	2	2	3	4	3	−1	2	9	2	12
20	3	4	4	5	4	−1	3	8	4	9
25	4	5	6	7	6	1	3	8	6	7
30	5	6	9	8	7	2	3	8	7	6
35	6	7	12	9	9	3	4	8	7	7
40	5	9	13	9	11	3	4	8	8	7
45	6	10	15	10	11	4	4	8	9	7
50	6	11	16	11	12	4	5	9	12	7
55	6	12	16	13	15	5	6	11	14	9
60	5	12	18	14	17	4	6	13	16	10
65	6	11	19	15	21	4	5	14	17	11
70	6	12	20	16	20	3	5	14	17	12
75	6	13	22	21	22	3	7	15	18	13
80	7	13	23	22	25	4	7	17	18	14
85	10	13	24	26	27	6	6	20	22	15
90	11	17	31	29	26	8	12	23	22	17
95	14	22	40	37	24	12	16	30	24	20

TABLE 496

RAPIDITY OF MOVEMENT OF THE HAND: SEX DIFFERENCES IN NUMBER OF TAPS IN 30 SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

Right Hand

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	4	3	7	3	4	−3	−1	−1	0	4
20	2	3	7	3	4	−2	2	1	3	5
30	1	5	9	4	7	−1	3	3	5	6
40	3	7	8	7	8	0	4	5	6	7
50	4	8	9	8	10	3	5	4	7	9
60	4	9	11	10	12	4	7	3	7	10
70	5	9	12	10	12	3	7	7	8	11
80	5	11	12	12	9	5	7	7	9	14
90	8	12	19	21	8	4	9	11	14	17

TABLE 496—*Continued*

LEFT HAND

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	0	10	−3	−2	12	0	3	5	0	4
20	1	4	5	4	7	0	2	5	3	4
30	2	3	6	7	5	1	3	4	3	5
40	2	3	6	6	6	1	4	5	5	4
50	2	4	6	8	7	0	4	4	6	5
60	3	4	6	9	7	0	4	4	7	6
70	3	6	7	8	9	1	3	6	8	7
80	4	7	11	8	11	1	3	8	9	9
90	9	10	17	14	12	−1	0	10	12	10

TABLE 497

RAPIDITY OF MOVEMENT OF THE HAND: SEX DIFFERENCES IN NUMBER OF TAPS IN 60 SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

RIGHT HAND

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	6	6	9	8	7	−7	2	0	11	6
20	5	6	15	11	13	−1	2	1	3	6
30	5	8	17	9	23	2	5	4	5	7
40	5	10	17	11	17	4	7	8	9	10
50	6	12	20	15	18	6	9	12	12	11
60	7	13	37	18	29	7	12	15	9	17
70	7	14	25	22	30	6	14	16	15	21
80	11	16	29	28	35	6	13	17	19	24
90	13	21	37	47	36	7	12	22	29	29

LEFT HAND

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	1	4	10	2	15	1	−3	5	6	7
20	1	5	11	7	8	−3	2	8	4	10
30	4	5	11	11	6	−1	4	6	6	8
40	4	6	12	14	9	−1	3	6	6	7
50	5	7	13	18	12	3	4	7	9	8
60	5	9	14	19	14	2	5	9	13	10
70	4	11	17	19	16	4	4	12	16	13
80	8	12	24	21	21	2	4	13	17	10
90	6	16	32	26	39	2	3	17	20	13

TABLE 498

LEFT-HANDEDNESS IN RAPIDITY

Age	Boys		Girls	
	No. of Cases	Per Cent	No. of Cases	Per Cent
14	50	6	31	5
15	32	5	26	5
16	42	7	23	4
17	38	8	19	5
18	17	5	14	6

In the case of rapidity of motion, left-handedness is rare in both sexes, and is but a trifle more frequent among boys than among girls. It proved to be slightly more common among working than among school children in both sexes (see Chapter V, Steadiness). Table 498 shows the relative frequency in the two sexes. The relative infrequency of left-hand superiority in rapidity is consistent with the constantly greater right-hand difference in all groups.

TABLE 499

CARD-SORTING: SEX DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	Time					Index				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	−7.0	−6.4	−6.5	−2.5	−6.5	−7.2	−4.6	−6.2	−4.3	−6.7
10	−5.8	−5.3	−5.8	−3.3	−4.2	−7.1	−5.3	−6.6	−3.7	−5.1
15	−5.7	−5.2	−5.1	−2.4	−3.2	−6.4	−5.3	−6.2	−3.9	−4.2
20	−5.4	−5.0	−4.5	−2.6	−3.0	−5.9	−5.4	−4.9	−3.7	−3.2
25	−5.2	−4.8	−3.9	−3.0	−3.3	−3.6	−3.2	−3.7	−3.6	−3.4
30	−5.0	−4.5	−4.1	−2.5	−3.1	−5.5	−5.1	−3.2	−4.3	−3.5
35	−4.9	−4.2	−3.8	−2.1	−3.0	−5.5	−4.9	−3.3	−3.6	−3.0
40	−4.5	−4.0	−3.5	−1.9	−2.7	−5.5	−4.6	−3.3	−3.3	−3.0
45	−4.2	−3.9	−3.2	−1.9	−2.6	−5.1	−4.4	−3.2	−3.0	−2.8
50	−3.9	−3.9	−3.0	−1.9	−2.6	−4.7	−4.3	−3.1	−2.7	−2.7
55	−3.6	−3.8	−2.8	−1.8	−2.6	−4.3	−4.1	−3.0	−2.6	−2.7
60	−3.3	−3.6	−2.6	−1.8	−2.7	−3.9	−4.0	−2.6	−2.6	−2.6
65	−3.2	−3.6	−2.4	−1.8	−2.6	−3.4	−3.8	−2.1	−2.5	−2.7
70	−3.1	−3.4	−2.2	−1.9	−3.3	−3.2	−3.6	−1.6	−2.4	−2.8
75	−3.2	−3.1	−2.3	−1.9	−3.3	−3.2	−3.3	−1.2	−2.6	−2.7
80	−3.2	−2.8	−2.5	−1.6	−2.3	−3.4	−2.9	−1.0	−2.6	−2.8
85	−3.2	−3.0	−2.5	−1.2	−1.7	−3.5	−3.0	− .5	−2.5	−1.0
90	−2.3	−3.2	−1.6	− .9	−1.3	−2.8	−3.3	− .2	−1.6	−1.0
95	−1.8	−1.9	− .7	− .5	−2.3	−2.5	−2.6	− .6	− .8	−2.2

CARD-SORTING

The sex differences in card-sorting are shown in Table 499 for the time and index of the entire group, and in Table 500 for school children (X) and working children (M) separately. In this test girls are superior to boys each year and in both measures—time and index. The differences are less at eighteen than at fourteen, but are still consistent and significant. They are slightly greater at eighteen than they were at seventeen.

The chief contrast between school and working groups is that working girls are decidedly more superior to working boys in card-sorting than school girls are to school boys.

In all the tables for card-sorting, the differences are greater in the lower than in the upper half of the scale. There is a greater contrast between inferior boys and girls in this measure than between superior ones.

TABLE 500

CARD-SORTING: SEX DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

TIME

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	−3.5	−2.0	−2.9	−2.4	− .4	−7.0	−6.1	−7.7	−4.8	−5.2
20	−3.5	−2.5	−2.4	−3.0	− .2	−7.0	−6.1	−5.8	−4.3	−3.2
30	−3.5	−2.0	−2.7	−2.0	−1.3	−6.1	−5.6	−5.3	−4.4	−3.6
40	−2.9	−2.2	−2.3	−1.8	−2.6	−5.8	−5.4	−4.6	−4.1	−2.6
50	−2.8	−2.1	−2.1	−2.0	−2.4	−5.4	−5.3	−4.0	−3.7	−2.5
60	−2.7	−2.2	−2.0	−2.0	−2.3	−5.8	−4.8	−3.3	−3.4	−2.4
70	−3.0	−2.4	−2.1	−2.2	−1.6	−5.0	−4.6	−2.7	−3.2	−2.3
80	−2.8	−1.8	−2.1	−1.8	− .9	−3.5	−4.3	−2.5	−3.2	−2.5
90	−2.3	−2.1	−1.1	−1.1	−1.1	−3.6	−3.3	−2.8	−2.4	−1.6

INDEX

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	−5.1	−3.3	−4.8	−4.2	− .9	−9.0	−5.9	−7.3	−3.7	−5.8
20	−5.1	−3.4	−3.0	−2.7	− .4	−7.4	−6.5	−6.5	−4.2	−4.0
30	−5.3	−2.7	−2.8	−2.4	− .3	−6.1	−6.2	−4.8	−4.3	−3.9
40	−4.6	−2.5	−2.8	−1.8	− .8	−5.9	−5.8	−4.0	−4.3	−3.5
50	−3.8	−2.3	−2.4	−2.0	−1.4	−5.7	−5.6	−3.6	−3.8	−3.1
60	−3.4	−2.1	−2.0	−3.0	−1.7	−4.9	−5.4	−3.2	−3.4	−3.0
70	−3.4	−2.1	−1.9	−2.0	−1.6	−4.0	−5.0	−2.4	−3.1	−3.0
80	−3.4	−2.6	−1.8	−2.0	− .9	−3.1	−4.7	−1.1	−3.2	−3.0
90	−2.3	−3.0	−1.4	−2.1	− .3	−3.5	−3.8	− .2	−2.7	−1.8

CANCELLATION

The sex differences between the percentile scales for the index of cancellation are given in Table 501 for the entire group, and in Table 502 for school children (X) and working children (M) separately. The differences are all in favor of the girls. They are similar in amount from year to year, though they are, on the whole, less at eighteen than at fourteen. The difference between the school group and the working group is that working girls are far more superior to working boys than school girls are to school boys. The sex differences are decidedly greater at the bottom than at the top of the scale—and this is particularly true among working children. In other words, girls who are poor in this capacity show more superiority to boys who are poor than girls who are good do to boys who are good.

The corresponding facts for accuracy of cancellation are given in Table 503 for the entire group, and in Table 504 for school (X) and working (M) children separately. The differences in accuracy are small each year, and are less at eighteen than at any previous year. They are not consistently in favor of either sex. Our conclusion must be that the large and consistent

TABLE 501

CANCELLATION — INDEX: SEX DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	−41.4	−32.7	−32.0	−32.3	−23.8
10	−28.7	−34.4	−23.0	−44.2	−23.7
15	−23.2	−32.4	−20.0	−38.9	−25.6
20	−21.7	−32.4	−19.0	−33.6	−23.1
25	−21.7	−30.1	−18.0	−28.8	−19.9
30	−20.4	−28.2	−17.0	−25.1	−17.7
35	−18.3	−27.8	−18.0	−22.3	−17.2
40	−17.5	−25.2	−18.0	−22.2	−17.8
45	−17.8	−24.1	−18.0	−22.2	−18.2
50	−18.2	−22.9	−18.0	−22.1	−18.9
55	−18.2	−21.7	−17.0	−21.6	−17.5
60	−17.9	−20.4	−18.0	−21.5	−19.6
65	−17.7	−19.1	−18.0	−21.3	−19.5
70	−18.1	−17.8	−16.0	−21.2	−19.5
75	−18.6	−16.6	−18.0	−21.5	−19.4
80	−19.0	−14.9	−17.0	−21.6	−19.5
85	−18.3	−14.2	−17.0	−21.8	−14.4
90	−17.7	−15.3	−17.0	−22.1	− 8.7
95	−16.0	−13.0	−15.0	−20.4	− 2.9

TABLE 502

CANCELLATION — INDEX: SEX DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	−17.7	−18.4	−11.1	−36.8	− 8.4	−38.0	−32.5	−32.0	−48.0	−20.1
20	−11.5	−16.1	−10.5	−15.8	− 1.9	−34.9	−37.8	−24.7	−39.1	−24.5
30	−19.3	−14.7	−12.9	−10.2	− .4	−31.3	−37.2	−23.6	−35.2	−21.6
40	−11.1	−21.8	−10.5	−12.6	− 2.8	−27.0	−35.7	−23.7	−35.3	−20.6
50	−10.7	−10.9	−10.4	−12.1	− 1.1	−25.0	−31.8	−24.3	−29.8	−21.3
60	− 7.7	− 9.5	− 9.8	−14.2	− 9.7	−24.0	−29.6	−22.2	−27.6	−21.7
70	−11.0	− 8.6	−10.4	−16.6	−11.3	−23.3	−27.5	−24.0	−24.9	−21.5
80	−15.8	− 9.2	−10.3	−16.9	−30.5	−21.8	−24.0	−24.6	−24.6	−21.3
90	−26.9	− 8.7	− 9.5	−18.1	−24.8	−18.7	−22.8	−23.1	−25.0	−15.7

TABLE 503

CANCELLATION — ACCURACY: SEX DIFFERENCES IN PERCENTS BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	1.0	.3	2.3	2.1	.2
10	1.7	− .5	1.3	1.8	−.3
15	1.2	−1.5	.8	2.1	−.5
20	.4	− .6	.2	1.5	−.7
25	.4	− .4	.2	1.4	−.6
30	.9	− .5	.2	1.3	−.2
35	1.5	− .7	.2	1.1	−.2
40	1.9	− .8	.1	1.1	−.2
45	1.7	− .7	.0	1.2	−.2
50	1.1	− .3	−.5	1.1	−.1
55	.9	− .2	−.3	.6	−.1
60	.7	− .2	−.5	.4	−.1
65	.7	− .2	−.3	.5	.0
70	1.0	− .2	−.2	.3	.0
75	1.2	− .1	−.2	.3	.0
80	1.3	− .1	−.2	.2	.0
85	.8	− .1	−.1	.2	.0
90	.5	.0	−.1	.1	.0
95	.3	.0	.0	.0	.0

TABLE 504 — CANCELLATION — ACCURACY: SEX DIFFERENCES IN PERCENTS BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	1.4	.9	.3	.0	−.1	−1.6	−6.9	1.6	5.0	−.1
20	1.9	.7	.2	−.9	.4	1.5	−1.3	.9	3.1	−.2
30	1.3	1.0	.2	−1.0	.2	1.0	−1.6	.7	2.6	−.2
40	.5	.9	.0	−.4	.2	.2	−2.5	.1	2.2	−.2
50	.6	.4	−.2	−.2	.1	1.7	−1.5	−.1	2.3	−.1
60	.7	.3	.0	−.3	.1	2.1	−.8	−.4	2.1	−.1
70	.7	.2	.0	−.1	.1	1.1	−.6	−.6	1.3	−.1
80	.4	.2	−.1	−.1	.0	1.7	−.5	−.4	.8	−.1
90	.2	.1	.0	−.1	.1	2.1	−.2	−.2	.4	.0

superiority of the girls in index of cancellation is due to superior speed rather than to superior accuracy. Accuracy in this test approaches 100 per cent so closely for both sexes that it does not constitute a good basis of comparison. It is curious to notice that in the two years in which the letter *a* was used—fourteen and seventeen—boys are more accurate, and in the two years in which the letter *m* was used—fifteen and eighteen—girls are more accurate. The comparison of school and working groups shows that whereas school boys have a slight lead over school girls in accuracy, working boys and girls are about equal. However, the differences in both groups are too small to be taken seriously.

SUBSTITUTION

The substitution test has three phases which must be presented separately: first, the performance of the practice pages, a type of routine copying; second, the index of the memory page, which is one measure of the perfection learning; and third, the accuracy of the memory page, which is a second measure of the perfection of learning.

The sex differences for the practice pages are presented in Tables 505 and 506 for the entire group, and in Tables 507 and 508 for school (X) and working (M) children separately. On the whole, girls are superior to boys in this type of copying, though the differences are comparatively small and not entirely consistent. Year sixteen shows boys on the whole superior. Girls are more consistently superior at the upper than at the lower end of the scale. The most inferior boys seem to do better than the most inferior girls but the superior girls are constantly a bit better than the superior boys.

A comparison of working and school groups shows that the superiority of the girls is much more marked and consistent among working children

TABLE 505 — SUBSTITUTION — INDEX OF PRACTICE PAGES: SEX DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	Page 1					Page 2				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	.4	−5.6	5.4	5.4	3.9	−6.4	−11.8	12.0	1.6	7.5
10	−2.4	−4.4	2.0	1.0	4.7	−3.4	−2.4	4.6	7.0	3.3
15	−5.8	−2.4	2.8	.8	2.5	−2.2	−3.8	3.6	2.2	1.4
20	−6.2	−5.2	.8	.0	− .7	.2	−1.9	1.6	1.4	−2.0
25	−7.0	−6.2	− .4	− .6	−3.1	.8	−4.4	.8	.6	−5.3
30	−5.0	−5.6	−1.0	−1.2	−5.4	2.0	−3.4	.0	− .2	−3.3
35	−4.2	−6.8	−1.8	−1.6	−4.6	.8	−3.7	− .4	.0	−3.7
40	−4.0	−4.4	− .8	−1.2	−3.4	.0	−2.5	.4	− .2	−4.1
45	−3.8	−4.5	−1.0	−1.8	−2.6	− .8	− .8	1.0	− .6	−4.5
50	−3.4	−4.0	− .4	−1.0	−2.0	−1.6	−1.2	1.6	− .4	−4.8
55	−3.0	−2.0	.2	−1.2	−1.3	−2.4	− .4	2.2	− .4	−4.5
60	−2.6	−2.6	.6	−1.0	− .6	−2.6	.4	2.6	− .4	−3.9
65	−2.6	−1.8	1.0	−1.0	− .1	−2.2	1.0	2.2	− .6	−3.3
70	−2.2	−1.4	.6	−1.6	− .3	−2.0	1.6	2.0	− .4	−2.7
75	−2.6	−1.2	1.0	−2.0	− .6	−1.8	2.4	1.8	− .4	−2.2
80	−2.2	− .6	2.0	−2.6	− .8	−1.4	1.0	1.2	.0	−1.7
85	−1.8	− .8	.6	−2.2	−1.1	−2.0	.6	1.0	.0	−1.1
90	−1.6	− .6	.2	−5.4	−1.4	−1.0	−1.0	.0	.0	−1.6
95	−3.2	− .2	.7	−4.4	−1.8	− .2	.7	.0	.0	.6

Percentiles	Page 3	
	14 yrs.	15 yrs.
5	−1.8	−8.2
10	− .6	−5.2
15	.6	−1.8
20	1.0	−1.2
25	1.2	− .4
30	1.4	− .2
35	2.2	− .2
40	1.2	− .2
45	1.2	− .2
50	.0	− .2
55	.6	− .2
60	.8	.0
65	− .6	− .1
70	.2	.0
75	− .2	.2
80	− .4	.2
85	− .6	.2
90	−1.8	.1
95	−1.0	.1

than among school children. Indeed, in the school series as a whole, one would have to say that boys show a slight superiority. Year sixteen shows the boys quite consistently superior in both groups.

The sex differences for the index of the memory page are given in Table 509 for the entire group, and in Table 510 for school (X) and working (M) children separately. In this measure of perfection of memorizing, the sex differences are not consistent. The general tendency is for girls to be superior at the upper end of the scale and boys at the lower end. In this measure also year sixteen shows a consistent superiority of boys in both groups which is not present in other years. The corresponding tables for accuracy (Table 511 for the entire group, and Table 512 for school [X] and working [M] children separately) show similar relationships — girls slightly superior at fourteen and fifteen, boys superior at sixteen, and conflicting results at seventeen and eighteen. Since the best of both groups and both sexes reach perfection, no differences appear at the upper end of the scale.

On the whole, then, sex differences in the substitution type of test are small and change from year to year. It is one of the types of performance in which characteristic differences of sex do not occur, though girls seem to make both the best successes and the worst failures.

TABLE 506 — SUBSTITUTION — INDEX — SUM OF THE PRACTICE PAGES: SEX DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

SUM OF PRACTICE PAGES

PERCENTILES	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	2	9	17	8	5
10	−2	−11	8	0	11
15	1	−13	4	−1	3
20	−3	−13	4	−2	−6
25	−4	−10	1	−1	−5
30	−4	−11	−2	−3	−3
35	−5	− 7	−1	−3	1
40	−4	− 3	0	−3	1
45	−4	− 4	3	−2	1
50	−2	− 7	5	−3	0
55	−1	− 6	5	−2	−1
60	−1	− 1	4	−2	−1
65	−1	0	3	−2	−2
70	−2	1	3	−3	−2
75	−4	0	3	−3	−2
80	−6	−1	4	−4	−3
85	−8	1	4	−4	−1
90	−5	1	3	−5	−1
95	−5	−3	5	−9	0

TABLE 507

SUBSTITUTION — INDEX OF PRACTICE PAGES: SEX DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

PAGE 1

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	10.4	5.8	3.9	1.3	11.6	−10.4	−5.8	−2.1	− .9	8.0
20	4.5	3.9	−3.6	.4	8.2	−15.7	−9.2	2.1	1.7	4.2
30	1.1	6.1	−1.3	−1.8	9.2	−15.7	−8.4	.6	.4	−1.7
40	.1	3.4	1.2	−3.6	5.8	−12.8	−9.2	.0	− .7	−4.3
50	− .4	2.7	3.7	−3.2	5.2	−10.1	−8.7	− .5	−1.1	−2.2
60	−7.	1.9	4.5	−3.4	4.8	− 7.6	−9.1	− .7	.3	− .9
70	−1.2	1.6	2.9	−3.6	4.4	− 5.8	−7.9	− .9	1.2	.5
80	− .4	.9	2.6	4.4	6.2	− 5.1	−5.2	−4.0	2.9	.4
90	− .2	1.3	4.5	2.9	10.2	− 4.4	−2.1	−1.2	.5	−1.0

PAGE 2

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	4.1	5.4	7.2	− .6	16.2	−8.7	− .5	3.4	7.0	3.8
20	3.4	2.1	1.8	− .8	9.8	−6.2	−6.1	1.0	4.0	.8
30	2.2	1.7	1.1	− .8	6.2	−2.4	−5.6	4.7	2.5	−5 .5
40	1.3	3.3	2.1	− .2	4.0	− .4	−5.2	−1.1	1.2	−4.0
50	.3	6.3	1.9	− .2	4.2	−2.8	−4.7	0	.6	−4.5
60	.1	5.5	1.7	− .8	4.4	−5.1	−3.0	1.3	.5	−4.9
70	.3	2.6	1.6	− .9	4.7	−7.5	−1.7	2.6	3.	−4.4
80	−2.0	1.4	1.6	−1.3	4.0	−6.0	− .2	1.7	1.1	−3.
90	.0	.6	2.9	−1.6	7.2	−7.1	.1	.1	1.9	−1.7

PAGE 3

PERCENTILES	X		PERCENTILES	M	
	14 yrs.	15 yrs.		14 yrs.	15 yrs.
10	2.2	9.7	10	−9.5	−6.9
20	5.5	5.6	20	−6.9	−4.5
30	6.6	4.0	30	−3.9	−4.9
40	4.2	1.7	40	−4.3	−2.7
50	3.6	.2	50	−3.2	−2.0
60	2.4	.7	60	−2.9	−1.3
70	2.1	.2	70	−3.0	− .5
80	.9	−.3	80	−3.1	.4
90	−.1	−.9	90	−2.5	1.2

TABLE 508

SUBSTITUTION — INDEX — SUM OF THE PRACTICE PAGES: SEX DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	22	37	7	1	45	− 1	0	24.	5	13
20	19	19	0	−2	24	−17	−17	3.0	−1	3
30	8	19	4	−2	18	−20	−21	1.0	−1	−4
40	7	7	5	−2	14	−25	−19	−2.0	0	3
50	7	11	5	−5	11	−17	−15	−2.0	2	2
60	4	8	8	−6	9	−14	−17	.0	−2	0
70	1	4	11	−6	8	−13	−12	2	0	−1
80	−6	4	11	−6	10	−11	− 7	1	−1	−2
90	−1	2	10	−8	−14	−10	− 4	−5	−8	−3

TABLE 509

SUBSTITUTION — INDEX — MEMORY PAGE: SEX DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	Page 4		Page 3		
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	11.0	− 5.1	18.5	5.0	11.5
10	1.9	−19.7	28.3	34.0	14.8
15	− .2	− 6.6	22.7	29.2	−6.8
20	2.5	− 5.4	13.1	15.3	−2.4
25	3.5	.2	16.5	7.3	−6.0
30	3.1	3.6	13.9	5.1	−8.2
35	3.5	2.0	11.8	4.3	−6.4
40	2.3	1.0	6.7	1.8	−6.0
45	2.5	.1	6.1	1.1	−7.0
50	2.8	− .2	5.3	1.1	−5.2
55	3.1	− .3	3.6	.3	−3.0
60	2.2	− .4	3.8	− .3	−1.0
65	1.6	− .3	4.0	− .6	− .2
70	.9	− .7	4.3	− .9	.5
75	.3	− .9	4.0	−1.5	.9
80	− .3	− 1.2	4.7	−1.9	1.2
85	.8	− 1.4	3.2	−2.2	1.4
90	− .7	− 1.8	1.9	−2.9	.2
95	− .4	− 3.6	.6	−4.3	−2.0

TABLE 510

SUBSTITUTION — INDEX — MEMORY PAGE: SEX DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

Percentiles	X					M				
	Page 4		Page 3			Page 4		Page 3		
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	9.6	4.1	41.0	2.8	2.8	−8.8	−16.2	17.3	57.0	26.5
20	4.4	9.0	24.8	− 6.3	−11.0	− .9	−10.2	27.5	31.3	7.1
30	2.0	5.8	13.3	−12.2	− 4.9	3.4	− 1.5	16.8	13.9	− 4.6
40	2.6	2.2	11.6	− 3.9	6.5	4.4	.4	9.7	11.0	− 2.3
50	5.5	2.2	6.1	− 3.1	2.0	1.4	− 1.0	2.8	5.8	−1.3
60	3.9	− .9	5.5	− 4.4	2.2	− .9	− .5	.9	1.8	−3.6
70	1.6	−2.8	4.9	− 6.0	10.3	−1.0	.2	2.3	.7	−1.8
80	−.7	−2.1	3.0	− 3.6	10.7	−1.1	1.4	3.7	2.3	−1.4
90	−.4	−2.4	.8	− 6.9	10.9	−1.6	.8	3.3	8.2	−1.2

TABLE 511

SUBSTITUTION — ACCURACY — MEMORY PAGE: SEX DIFFERENCES IN PERCENTS BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	.0	−1.2	8.3	15.6	9.1
10	−3.7	−4.0	5.8	2.2	2.7
15	−2.6	−2.2	3.9	2.3	.9
20	−2.6	− .7	3.9	2.7	− .1
25	−1.6	−1.3	2.9	2.4	− .5
30	−1.2	−1.1	3.1	1.4	−2.0
35	− .7	− .7	2.2	1.1	−1.6
40	− .2	− .9	1.6	.6	− .9
45	− .2	− .3	1.2	.5	.2
50	− .2	− .2	1.0	.3	.4
55	− .4	− .1	.6	.2	.6
60	− .5	.0	.5	.1	.8
65	− .2	.0	.6	.0	.3
70	−1.6	.0	2.1	.0	.0
75	.0	.0	.0	.0	.0
80	.0	.0	.0	.0	.0
85	.0	.0	.0	.0	.0
90	.0	.0	.0	.0	.0
95	.0	.0	.0	.0	.0

TABLE 512

SUBSTITUTION — ACCURACY — MEMORY PAGE: SEX DIFFERENCES IN PERCENTS BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	−6.9	− .2	7.0	−8.4	−.7	−.4	−7.6	4.3	9.3	4.7
20	−5.2	− .4	3.3	−5.6	1.7	1.2	−1.1	3.7	7.7	.3
30	−4.5	−1.4	2.6	−2.4	.6	1.8	− .2	3.8	7.3	−1.7
40	−1.4	−1.0	.2	−1.4	.8	1.5	− .7	1.3	2.0	−1.4
50	− .7	− .2	1.0	− .6	.5	.6	− .3	.7	1.1	.5
60	− .8	.0	.5	− .6	.0	.3	− .1	.6	.8	.9
70	− .4	.0	.0	.0	.0	.1	.1	2.4	.0	.3
80	− .3	.0	.0	.0	.0	.0	− .1	.0	.0	.0
90	− .1	.0	.0	.0	.0	.0	.0	.0	.0	.0

MEMORY

The sex differences in the percentile scales for rote memory—seven-, eight-, and nine-place series and the sum of the three series—are given in Tables 513 and 514 for the entire group. The corresponding differences for school (X) and working (M) children separately are given in Tables 515 and 516. The trend in these tables is consistently in favor of somewhat better rote memory among the girls. As the task becomes harder in passing from the seven- to the nine-place series, the superiority of the girls becomes larger and more consistent. The differences are small at best, because the task was so easy that a very large number of individuals reached or approached perfection. For this reason also differences tend to disappear at the upper end of the scale. The best of both sexes made perfect records. The superiority of the girls in rote memory is greater at eighteen than at any previous year.

The chief contrast observable between records of school and of working children is that the superiority of working girls over working boys is more marked and more consistent from year to year than the superiority of school girls over school boys. There are some instances in the table for school children in which boys are equal to girls, or are slightly superior. Indeed, at years fifteen, sixteen, and seventeen, the differences, though exceedingly small, favor the school boys rather than the girls. In no instance do working boys equal the working girls. However, at eighteen years, feminine superiority is clear in both groups and is in both groups increasingly evident in the more difficult series.

TABLE 513

MEMORY: SEX DIFFERENCES IN PER CENT OF ACCURACY BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	7-Place Series					8-Place Series				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	1.4	−3.7	−1.8	− .3	2.4	.7	.1	−1.2	−4.0	−5.0
10	.2	−2.1	− .9	− .4	− .5	1.6	.6	1.2	−2.5	−4.8
15	−.9	−2.9	−1.4	.3	−1.4	.3	− .2	.3	−1.5	−2.2
20	.3	− .5	− .4	.0	−1.1	−1.2	.0	.3	−1.5	−3.3
25	−.1	− .5	− .7	− .2	− .7	−1.1	.0	− .4	− .4	−2.0
30	−.2	− .4	− .3	− .7	− .7	−1.5	− .3	−1.2	− .8	−1.5
35	−.4	− .6	− .4	−1.0	−1.1	−1.2	− .8	− .4	− .9	−1.2
40	−.6	−1.0	.3	−1.3	−1.1	−1.1	−1.0	− .2	− .8	−3.7
45	−.6	−1.1	.0	− .5	−1.0	−1.3	−1.4	− .6	− .2	−1.0
50	−.8	− .5	.0	− .4	− .8	−2.4	−1.5	.0	.0	−1.3
55	−.7	− .4	.0	− .3	− .7	−1.3	−1.4	.0	.3	−1.0
60	−.7	− .4	− .3	− .3	− .7	−1.3	−1.2	.0	.5	−1.2
65	−.5	− .3	− .7	− .3	− .4	−1.5	− .8	.0	.3	− .7
70	−.5	− .3	.0	− .3	.0	− .6	− .7	.0	.3	− .7
75	−.2	− .2	.1	− .3	− .1	− .4	− .7	.0	.2	− .6
80	−.3	.0	.0	− .2	− .7	− .2	− .4	.0	.2	− .6
85	−.5	− .2	.2	− .1	− .7	− .2	.0	.0	.1	− .5
90	−.1	− .1	.3	− .1	− .3	− .1	− .2	.0	.1	− .1
95	−.5	.0	.0	− .1	.0	− .1	− .1	.6	.0	.0

Percentiles	9-Place Series				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	− .3	1.5	1.1	−1.3	−7.8
10	.5	− .4	1.1	−2.2	−8.5
15	− .1	−1.9	.8	− .9	−6.6
20	− .9	−1.1	− .9	−1.3	−7.1
25	−1.2	−1.2	−2.3	− .7	−5.5
30	−1.6	− .8	−2.0	− .1	−4.8
35	−1.8	− .3	−1.8	.2	−3.6
40	−2.2	− .4	−1.7	−1.8	−3.9
45	−2.7	− .9	− .5	−2.0	−3.6
50	−2.7	−1.3	−1.9	−1.0	−3.3
55	−2.6	−1.6	− .5	− .8	−3.3
60	−2.9	−1.9	.2	−1.3	−1.4
65	−4.6	− .2	− .3	−1.6	− .8
70	−3.4	.1	.6	−1.3	−2.5
75	−2.5	.3	.9	− .5	− .5
80	−2.3	.1	.5	.3	− .5
85	−1.6	.2	.0	.2	− .6
90	− .9	.6	1.1	.2	− .6
95	− .2	.5	.0	.1	− .6

TABLE 514

MEMORY – SUM OF THE 7-, 8-, AND 9-PLACE SERIES: SEX DIFFERENCES BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

PERCENTILES	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
5	0	−5	0	−2	−11
10	−4	−5	−5	−4	− 9
15	−5	−2	−5	−5	− 8
20	−5	2	−5	−3	−12
25	−4	3	−3	−5	−12
30	−4	1	−1	−5	−10
35	−4	1	−2	−5	− 9
40	−4	0	−2	−4	− 7
45	−5	−1	−1	−3	− 6
50	−5	−3	−1	−3	− 6
55	−5	−3	−1	−3	− 6
60	−5	−3	−1	−2	− 4
65	−5	−2	0	−1	− 2
70	−5	−2	0	−1	− 1
75	−4	−2	0	−1	− 3
80	−4	−3	0	0	0
85	−2	−2	0	1	0
90	0	0	−1	0	0
95	0	−1	0	0	0

TABLE 515

MEMORY: SEX DIFFERENCES IN PER CENT OF ACCURACY BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

7-PLACE SERIES

PERCENTILES	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	.6	−1.3	−3.9	−5.2	2.1	−3.1	−2.3	.2	1.5	1.4
20	3.3	.7	− .7	−1.7	−.3	−1.1	−1.0	−.2	3.2	−4.2
30	−.2	.2	− .5	−2.2	−.3	− .7	−1.0	−.3	1.3	−1.4
40	−.6	.0	.0	− .5	.0	− .6	−1.4	−.5	−.2	− .9
50	−.6	.0	.0	− .5	.0	− .7	−1.6	−.2	−.5	− .7
60	−.4	.0	− .8	− .3	.1	− .8	− .7	−.1	−.3	− .1
70	−.3	.1	.0	− .3	.0	− .7	− .6	−.1	−.2	.0
80	−.2	.0	.0	− .1	.0	− .4	− .1	−.6	−.2	.1
90	−.1	− .1	.0	− .1	.0	− .4	− .2	.0	−.1	.0

TABLE 515—*Continued*

8-Place Series

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	−2.3	10.1	5.6	− .8	−5.5	− .6	2.4	−1.3	−6.9	−2.9
20	−2.1	6.7	2.5	−2.1	.6	− .7	− .7	−3.7	−1.2	−1.2
30	− .8	9.1	.3	− .7	−5.3	−2.1	−1.5	−3.3	.4	−2.4
40	− .1	5.7	.4	.0	− .6	−2.0	−3.1	−1.9	.2	−4.7
50	.1	3.8	.3	.5	− .6	−4.0	−2.6	−1.4	− .2	− .5
60	− .7	3.9	.0	.3	− .5	−2.3	−2.0	− .6	.5	− .6
70	.1	1.1	−.7	.2	− .6	−2.3	−2.1	.0	.7	.0
80	.6	1.4	.0	.2	− .6	−1.0	−1.2	.0	.3	.0
90	.2	1.0	.1	.1	− .6	− .7	.0	−1.2	.2	.7

9-Place Series

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	−1.7	3.2	2.1	−.7	−3.3	1.3	− .9	.1	1.5	−6.2
20	−1.2	.3	− .5	2.9	−5.9	1.1	−2.7	.5	− .3	−6.3
30	−1.8	1.3	−1.2	−.2	−3.6	−2.1	−2.1	−1.6	−1.6	−3.8
40	−3.7	.5	.8	.9	−4.1	−3.1	−1.2	−2.7	− .8	−1.9
50	−3.8	.4	.9	.3	−2.0	−2.1	−1.6	−3.0	−2.2	−2.3
60	−5.2	1.8	− .1	.2	−3.5	−1.1	−3.7	−1.2	−1.2	− .9
70	−3.0	.9	1.2	1.5	−2.5	−2.2	−1.2	− .1	−2.3	−1.2
80	−1.4	.0	.0	.7	−1.5	−2.3	.1	.7	−1.5	.0
90	−1.4	1.0	− .6	.4	− .4	− .4	.8	.1	− .4	.0

TABLE 516

MEMORY — SUM OF THE 7-, 8-, AND 9-PLACE SERIES: SEX DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

Percentiles	X					M				
	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	−5	2	−2	−7	−16	−3	−2	−3	− 1	−6
20	−1	8	2	−2	−12	−6	−2	−7	− 3	−6
30	−4	7	4	−2	−10	−6	−3	−6	− 4	−9
40	−6	1	3	−3	−12	−2	−5	−5	− 6	−8
50	−6	3	3	0	−15	−3	−8	−5	− 4	−3
60	−5	0	2	0	− 3	−4	−8	−4	− 2	−3
70	−5	−1	−2	3	− 6	−5	−4	−3	− 3	−0
80	−3	0	0	2	− 1	−3	−5	−1	− 1	3
90	−1	0	−1	0	0	−1	0	0	− 1	0

COMPLETION OF SENTENCES

The sex differences between the percentile scales for index of ideas (seconds per idea expressed) are given in Table 517 for the entire group, and in Table 518 for school (X) and working (M) children separately. Girls are superior to boys each year from fourteen to sixteen. Their superiority increases from year to year. A comparison of school and working groups shows that at fourteen and fifteen working girls show more superiority to working boys than school girls do to school boys. At sixteen both groups of girls are consistently superior to the boys. Girls are more consistently superior to boys at the upper than at the lower end of the scale.

In association time, measured in terms of the number of sentences begun in two seconds or less (see Tables 519 and 520), at fourteen girls have a slight advantage, at fifteen boys are ahead, and at sixteen girls are once more in the lead. A comparison of the school (X) and working (M) groups shows that among school children boys are ahead at fourteen years and girls at fifteen and sixteen, while among working children boys are ahead at fourteen and fifteen and girls at sixteen. Our conclusion must be that the results show no characteristic sex difference in association time.

The comparison on the basis of number of correct sentences is shown in Table 521 for the entire group, and in Table 522 for school (X) and working (M) children separately. The measure is a poor one because of

TABLE 517 — SENTENCES — INDEX OF IDEAS: SEX DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

PERCENTILES	14 yrs.	15 yrs.	16 yrs.
5	−1.9	.2	−1.1
10	− .1	.5	− .3
15	.3	.5	− .7
20	.2	.0	− .9
25	.0	−.2	− .5
30	− 2	−.3	− .9
35	− .2	−.2	− .6
40	− .1	−.2	− .6
45	− .1	−.2	− .6
50	.0	−.2	− .7
55	− .1	−.2	− .6
60	− .2	−.1	− .6
65	− .2	−.2	− .6
70	− .2	−.2	− .6
75	− .2	−.3	− .5
80	− .2	−.2	− .5
85	− .1	−.2	− .5
90	− .2	−.1	− .4
95	− .1	.0	− .4

TABLE 518

SENTENCES — INDEX OF IDEAS: SEX DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

Percentiles	X			M		
	14 yrs.	15 yrs.	16 yrs.	14 yrs.	15 yrs.	16 yrs.
10	1.8	.4	−1.0	−2.5	−.8	−1.3
20	.8	.3	− .5	−1.3	.5	− .3
30	.1	.3	− .9	− .7	−.4	−1.1
40	.2	.0	− .7	− .5	−.8	−1.0
50	.1	.0	− .7	− .4	−.3	−1.0
60	.0	−.2	− .5	− .3	−.2	− .7
70	−.1	−.3	− .4	− .4	−.3	− .5
80	−.1	−.1	− .4	− .5	.1	− .4
90	−.2	−.1	− .3	− .2	−.1	.4

TABLE 519

SENTENCES — NUMBER BEGUN IN TWO SECONDS OR LESS: SEX DIFFERENCES BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.
5	.0	.0	.0
10	.1	.4	.0
15	.2	.6	−.2
20	.1	.9	−.2
25	−.1	1.0	−.2
30	−.3	1.3	−.2
35	−.3	1.4	−.4
40	−.2	1.1	−.4
45	−.2	1.0	−.5
50	−.1	1.1	−.6
55	−.1	1.1	−.4
60	−.2	1.1	−.6
65	−.1	.9	−.6
70	.0	.8	−.4
75	.0	.6	−.2
80	.1	.3	−.2
85	.0	.0	.2
90	.0	.0	.2
95	.1	.0	.0

TABLE 520

SENTENCES — NUMBER BEGUN IN TWO SECONDS OR LESS: SEX DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

Percentiles	X			M		
	14 yrs.	15 yrs.	16 yrs.	14 yrs.	15 yrs.	16 yrs.
10	.4	.9	.1	.2	.0	− .7
20	.0	1.4	.0	.1	.6	−1.1
30	−.3	1.7	−.1	−.2	1.0	−1.6
40	−.4	1.6	.1	.5	1.4	−2.0
50	−.6	1.6	1.1	.2	.8	−2.1
60	−.2	1.2	1.0	.1	.8	−2.4
70	−.1	.6	1.1	−.2	.8	−2.8
80	−.2	.1	1.1	.0	.7	−2.5
90	−.1	.1	.4	.4	.2	−1.7

TABLE 521

SENTENCES — NUMBER CORRECT: SEX DIFFERENCES BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.
5	−.3	.3	−.5
10	.0	.2	−.3
15	−.1	.0	−.4
20	−.2	−.1	−.2
25	−.1	.0	−.2
30	−.1	.0	−.3
35	−.1	−.1	−.2
40	.0	.0	−.1
45	.0	.0	−.1
50	.0	.0	−.1
55	.1	.0	−.1
60	.0	.0	.0
65	.0	.0	−.1
70	.1	.0	−.1
75	.0	.0	.0
80	.0	.1	.0
85	.0	.0	.0
90	.1	.0	−.1
95	.0	.0	.0

TABLE 522

SENTENCES — NUMBER CORRECT: SEX DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

Percentiles	X			M		
	14 yrs.	15 yrs.	16 yrs.	14 yrs.	15 yrs.	16 yrs.
10	.3	−.1	−.2	−.1	.9	−.9
20	.0	−.1	−.4	−.2	.3	−.8
30	.1	−.2	−.1	−.1	.0	−.5
40	.2	.0	.0	−.1	.2	−.4
50	.0	−.1	−.1	−.2	.2	−.3
60	.1	.0	−.1	.0	.1	−.1
70	.1	−.1	.0	.0	.1	.0
80	.0	.0	.0	.1	.0	−.1
90	.0	−.1	.0	.0	−.1	.0

TABLE 523

SENTENCES — NUMBER OF IDEAS: SEX DIFFERENCES BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	14 yrs.	15 yrs.	16 yrs.
5	− .6	−.4	−1.5
10	− .1	−.4	−1.4
15	−1.4	−.5	−2.2
20	− .7	−.2	−2.1
25	−1.4	−.1	−2.1
30	− .9	.0	−2.0
35	−1.5	.2	−1.8
40	− .7	.1	−1.8
45	− .5	.1	−1.4
50	− .2	−.1	−1.3
55	− .1	−.1	−1.5
60	− .3	−.2	−1.6
65	.4	−.1	−1.7
70	1.2	.0	−1.9
75	1.5	.2	−1.6
80	2.2	.5	−1.9
85	.2	.5	−1.9
90	.1	.9	−1.9
95	1.0	−.4	−1.6

TABLE 524

SENTENCES — NUMBER OF IDEAS: SEX DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

Percentiles	X			M		
	14 yrs.	15 yrs.	16 yrs.	14 yrs.	15 yrs.	16 yrs.
10	−1.2	−.9	−2.4	.0	−.1	−1.0
20	−1.1	−.3	−2.6	−.4	−.3	−1.5
30	− .1	.1	−2.1	−.6	−.1	−1.7
40	− .7	−.1	−2.0	−.6	−.2	−1.3
50	−1.3	−.3	−2.4	−.7	−.6	−1.2
60	−1.0	.2	−2.2	−.4	−.9	− .9
70	− .6	−.1	−1.8	.1	−.5	−1.1
80	− .7	−.2	−2.4	−.6	.0	−1.3
90	−1.3	−3.0	−1.7	−.7	.7	−1.7

the very large number of children who reached or approached perfection. The small difference which exists is on the whole in favor of the girls. It is larger and more consistent at sixteen than at either previous year. The trend toward superiority among girls is present in both series, school and working.

The differences between the percentile scales for number of ideas are given in Table 523 for the entire group, and in Table 524 for school (X) and working (M) children separately. In this measure also girls are superior to boys. Their superiority is more marked at sixteen than at either previous year. In this instance, school girls show even more superiority to school boys than working girls do to working boys.

Mutilated Text

In years seventeen and eighteen, a multilated-text test was substituted for the sentence-completion test. The sex differences based upon the time required to perform the test are presented for the whole group in Table 525, and for school (X) and working (M) children separately in Table 526. Girls are superior to boys at both ages. Their superiority is much greater at eighteen than it was at seventeen. There are no consistent and significant contrasts in this respect between school and working children.

The sex comparison on the basis of accuracy of performance is given for the whole group in Table 527, and for working and school children separately in Table 528. In this measure also girls are superior. Their superiority is more consistent in terms of accuracy than it was in terms of time. Among school children the superiority of the girls in accuracy is greater at eighteen than it was at seventeen, while the reverse is true among working children. Girls hold the supremacy in general both in accuracy and in time, and their superiority in this type of performance is undoubted.

TABLE 525

MUTILATED TEXT — TIME: SEX DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

PERCENTILES	17 yrs.	18 yrs.
5	− 3.0	−29.8
10	− 2.3	−70.4
15	− 2.3	−34.0
20	− 5.8	−29.3
25	− 4.0	−38.7
30	− 7.8	−33.0
35	− 9.9	−33.7
40	−12.7	−31.7
45	− 9.8	−29.6
50	− 6.0	−29.4
55	− 3.4	−27.2
60	.2	−21.0
65	3.6	−18.9
70	2.4	−20.4
75	− 5.6	−20.1
80	−14.9	−18.1
85	−16.6	−12.3
90	−17.1	− 8.4
95	−12.7	− 8.5

TABLE 526

MUTILATED TEXT — TIME: SEX DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

PERCENTILES	X		M	
	17 yrs.	18 yrs.	17 yrs.	18 yrs.
10	−48.4	−64.1	1.8	−63.4
20	− 7.5	−22.8	2.2	−17.5
30	7.0	− 7.5	18.2	− 8.0
40	6.2	5.0	9.5	−11.3
50	5.3	− 3.4	−4.1	−17.3
60	− 4.5	−15.8	−5.9	−15.1
70	−22.3	− 8.4	− .8	− 8.7
80	−19.4	.6	11.1	−10.3
90	−12.6	− 4.1	−.6	5.9

TABLE 527

MUTILATED TEXT — ACCURACY: SEX DIFFERENCES IN PERCENTS BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	17 yrs.	18 yrs.
5	−3.4	−5.0
10	−6.5	−11.0
15	−7.1	−4.9
20	−10.0	−3.1
25	−7.7	−6.0
30	−9.8	−9.0
35	−10.0	−9.9
40	−11.3	−8.6
45	−10.8	−9.3
50	−10.3	−9.4
55	−6.3	−8.2
60	−5.6	−7.5
65	−7.9	−9.5
70	−6.6	−10.4
75	−3.9	−10.7
80	−4.4	−10.4
85	−1.5	−10.2
90	−1.0	−8.2
95	−1.8	−3.1

TABLE 528

MUTILATED TEXT — ACCURACY: SEX DIFFERENCES IN PERCENTS BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

Percentiles	X		M	
	17 yrs.	18 yrs.	17 yrs.	18 yrs.
10	−10.6	−9.4	−3.1	−3.5
20	−9.9	−10.0	−4.4	.8
30	−7.2	−9.9	−8.3	−.8
40	−8.3	−11.7	−6.0	−4.5
50	−5.1	−15.4	−8.3	−3.1
60	−5.2	−10.8	−9.6	−4.8
70	−1.2	−9.6	−5.9	−1.6
80	−.6	−5.1	−3.4	−.3
90	−1.3	−1.8	−.5	5.4

ASSOCIATION BY OPPOSITES

There are five series of association by opposites—easy opposites at fourteen, fifteen, and eighteen, and hard opposites at seventeen and eighteen. The sex differences between the percentile ranks are given in Table 529 for the entire group, and in Table 530 for school (X) and working (M) children separately. The tables for the whole group show a consistent superiority on the part of girls. The blanks used and the method of correcting for differences of difficulty (see Chapter V) modify somewhat the details of comparison, though the selection of blanks was so similar for boys and girls that the sex difference can be relied upon. At fourteen and fifteen various blanks were used and the results corrected for differences of difficulty. This gave an opportunity for high scores on the part of superior children, which did not exist when only the easiest blanks were used, as at year eighteen. Accordingly, at year fourteen and fifteen there is a tendency for differences to be greater at the upper end of the scale than at the lower, whereas in year eighteen differences disappear at the upper end of the scale for easy opposites because the scores were all perfect. Year seventeen for the hard opposites offers a good basis of comparison. Year eighteen, on the other hand, includes only the better portion of the working group, because the poorest ones were not even tried with this test.

The comparison of school and working groups shows that in this measure school girls show greater superiority to school boys than working girls do to working boys. This is one of the few instances in which the advantage of school girls over school boys is greater than that of working girls over working boys. Among school children, girls are superior in every series. At fourteen and fifteen, where very high scores on difficult lists were possible, the school girls are increasingly superior at the upper end of the scale. Among working children, the tendency is toward an equality, or even superiority of boys at the upper end (see 15 easy). In hard opposites at seventeen, while school girls are very superior to school boys, there is but a slight difference in sex among working children, and that little in favor of the boys. At eighteen, the method of selection of working children to whom the test was given renders sex comparison of doubtful value, but the comparison of school boys and girls is entirely valid and shows the same superiority of the girls.

Our general conclusion must be that girls are superior to boys in association by opposites, and that the sex difference tends to increase from fourteen to eighteen among school children but to decrease among working children.

TABLE 529

EASY AND HARD OPPOSITES: SEX DIFFERENCES IN PER CENT OF ACCURACY BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

PERCENTILES	14 yrs. Easy	15 yrs. Easy	18 yrs. Easy	17 yrs. Hard	18 yrs. Hard
5	−1.8	1.3	−5.2	− .7	−14.5
10	−3.3	−2.0	−3.7	.0	− 9.4
15	−1.8	−2.1	−2.6	1.2	− 6.1
20	− .8	−2.5	−3.0	1.3	− 7.2
25	− .5	−3.2	−2.0	.5	− 5.7
30	− .5	−3.5	−1.8	−1.6	− 4.5
35	− .9	−3.2	−1.8	−1.5	− 7.4
40	−1.1	−2.7	−1.7	−2.9	− 7.0
45	−1.2	−2.2	−1.3	−4.1	− 4.9
50	−1.2	−1.8	−1.2	−3.7	− 3.8
55	− .8	−1.7	−1.2	−4.6	− 3.1
60	− .7	−1.3	−1.2	−5.3	− 4.5
65	− .6	−1.1	−1.2	−5.7	− 4.5
70	− .5	−2.2	− .7	−6.3	− 3.6
75	−1.6	−3.3	.0	−6.4	− 4.3
80	−2.3	−5.0	.0	−6.3	− 3.4
85	−2.9	−5.8	.0	−5.4	− 4.2
90	−7.5	−5.7	.0	−3.4	− 4.8
95	−8.0	−9.7	.0	− .8	− 4.2

TABLE 530

EASY AND HARD OPPOSITES: SEX DIFFERENCES IN PER CENT OF ACCURACY BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

PERCENTILES	X					M				
	14 yrs. Easy	15 yrs. Easy	18 yrs. Easy	17 yrs. Hard	18 yrs. Hard	14 yrs. Easy	15 yrs. Easy	18 yrs. Easy	17 yrs. Hard	18 yrs. Hard
10	− .8	− 1.7	−2.6	−10.3	−8.1	−7.5	−1.3	−1.8	−1.0	−13.7
20	− 1.5	− 2.7	−1.5	−10.6	−6.9	−8.1	−2.2	−1.5	2.0	− 8.8
30	− 1.3	− 1.8	−2.1	− 8.4	−6.6	−3.9	−2.5	.3	3.0	− 3.8
40	− .2	− 1.4	−2.4	− 6.7	−6.0	−2.5	−3.5	.4	2.0	− 5.2
50	− 1.1	− 3.1	− .2	− 7.3	−5.2	−1.6	−2.6	.1	1.0	− .6
60	− 1.8	− 5.6	.0	− 6.8	−5.8	−1.1	−1.8	− .5	.0	− 2.5
70	− 5.0	− 9.4	.0	− 5.2	−4.4	−2.9	− .1	1.2	.0	3.5
80	− 9.5	−10.3	.0	− 2.5	−3.6	−1.9	4.2	.0	.4	.5
90	−12.2	−14.7	.0	− .7	−5.5	−1.3	4.2	.0	.0	.3

Cause and Effect

At year sixteen a cause-and-effect test was used instead of an association-by-opposites test. Unlike the association-by-opposites test, the cause-and-effect test is not a mere controlled-association test. It is in a small measure a memory test.

The sex difference in cause and effect based upon a comparison of the percentile scales in terms of percentage of correct associations is given in Table 531 for the entire group, and in Table 532 for school (X) and working (M) children separately. In this test also girls are consistently superior to boys. The test proved to be too easy for the majority of sixteen-year-old children. At the upper end of the scale the proportion of perfect responses was so great in both sexes that differences disappear. The fact that working girls show more superiority over working boys than school girls do over school boys is probably but another expression of the fact that the test was much easier for school than for working children. School children were all too near perfection to show large differences of sex.

TABLE 531 — CAUSE AND EFFECT: SEX DIFFERENCES IN PER CENT CORRECT BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	16 yrs.	Percentiles	16 yrs.
5	−3.6	55	−1.5
10	−4.3	60	−1.0
15	1.2	65	− .8
20	− .3	70	−1.0
25	−2.0	75	−3.0
30	−1.8	80	− .6
35	−1.0	85	.0
40	−2.3	90	.0
45	−3.4	95	.0
50	−1.7		

TABLE 532 — CAUSE AND EFFECT: SEX DIFFERENCES IN PER CENT CORRECT BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

Percentiles	X — 16 yrs.	M — 16 yrs.
10	2.0	−4.3
20	−1.6	−3.5
30	−2.8	−4.6
40	− .3	−4.5
50	− .3	−4.0
60	−2.3	−5.2
70	.0	−2.8
80	.0	−3.0
90	.0	−4.0

Construction Puzzles

Construction-puzzle tests were given at years sixteen, seventeen, and eighteen. The tests were all performed with the same blocks, fitted into patterns of varying degrees of difficulty (see Chapter IV).

The sex differences between the percentile scales for the entire group of children are presented in Table 533, and those for school (X) and working (M) children separately in Table 534. The tables show an overwhelming superiority of boys over girls. The only exception to it is the upper portion of the scale of the seal test at eighteen years, in which, curiously enough, girls excel. All of these tests except the flower-pot are so difficult that a large proportion of children fail to solve them in the time allowed and are simply recorded as failures. Comparisons, therefore, are made chiefly in the upper half of the scale. At the point where successes in both sex scales are recorded and comparisons accordingly become significant, the general tendency is for the sex differences to be relatively large and to decrease as the scale is ascended. By the time the top five percentile is reached, therefore, differences are relatively small and are in two scales in favor of girls.

TABLE 533

CONSTRUCTION PUZZLES — TIME: SEX DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	16 yrs. Egg	16 yrs. Flower-Pot	17 yrs. Chick	17 yrs. Boat	18 yrs. Cradle	18 yrs. Seal
5	.0*	75 *	.0*	.0*	.0*	.0*
10	.0*	45.9	.0*	.0*	.0*	.0*
15	.0*	40.5	.0*	.0*	.0*	.0*
20	.0*	34.4	.0*	.0*	.0*	.0*
25	.0*	28.5	.0*	.0*	.0*	.0*
30	.0*	21.9	−.2	.0*	.0*	.0*
35	.0*	18.5	5.6	25.9*	.0*	.0*
40	.0*	14.7	14.3	52.6	.0*	.0*
45	.0*	11.8	23.6	38.7	.0*	.0*
50	.0*	11.1	17.3	26.2	8.9*	.0*
55	.0*	9.6	20.6	26.2	26.2*	.0*
60	.0*	8.2	22.5	21.9	25.2	.0*
65	.0*	8.1	20.1	15.2	15.6	.0*
70	29.4*	7.8	20.0	13.1	26.6	17.2
75	42.0	6.7	18.3	11.3	23.3	14.6
80	38.5	4.0	13.6	9.6	33.9	− .5
85	37.0	2.0	7.0	8.9	17.8	− 4.9
90	13.8	.3	4.7	5.0	13.3	−19.1
95	2.3	−.5	5.3	5.2	7.6	−15.9

* Values marked thus mean that one or both members of the comparison was merely failure at the end of the time limit.

TABLE 534

CONSTRUCTION PUZZLES — TIME: SEX DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

X

Percentiles	16 yrs. Egg	16 yrs. Flower-Pot	17 yrs. Chick	17 yrs. Boat	18 yrs. Cradle	18 yrs. Seal
10	.0*	48.5	.0*	.0*	.0*	.0*
20	.0*	32.7	21.0	−27.0*	.0*	.0*
30	.0*	17.0	35.3	−16.5	22.1*	.0*
40	.0*	9.9	61.7	54.9	7.5	.0*
50	.0*	6.3	43.0	21.7	17.6	.0*
60	.0*	5.4	40.0	11.1	29.1	−40.8
70	28.2*	2.7	31.5	5.1	42.5	− .3
80	38.4	1.2	13.7	9.4	29.1	6.4
90	2.4	−.2	6.4	7.2	23.2	−13.2

M

Percentiles	16 yrs. Egg	16 yrs. Flower-Pot	17 yrs. Chick	17 yrs. Boat	18 yrs. Cradle	18 yrs. Seal
10	.0*	38.8	.0*	.0*	.0*	.0*
20	.0*	31.7	.0*	.0*	.0*	.0*
30	.0*	23.3	.0*	.0*	.0*	.0*
40	.0*	17.5	.7	15.0*	.0*	.0*
50	.0*	13.4	−.9	91.4*	.0*	.0*
60	.0*	11.7	3.3	76.3	51.6*	.0*
70	32.3*	9.7	2.9	42.6	36.8	14.9*
80	36.8	8.4	6.1	29.9	37.1	39.3
90	9.4	3.7	11.9	19.7	15.4	− 9.2

* Values marked thus mean that one or both members of the comparison was merely failure at the end of the time limit.

No consistent contrast appears when school children and working children are compared. In some of the tests the superiority of the school boys is the more marked, and in others that of the working boys. There are more instances in which school girls show superiority over boys than there are in which working girls show superiority. Our general conclusion is that boys show a marked superiority over girls in construction-puzzle tests, both among school children and among working children.

Puzzle Boxes

The Healy and Fernald puzzle box was given at fifteen years and repeated at sixteen years with the purpose of making the real test ability to close the box again. The proportion of successes in closing the box was too small to make it a possible element of a scale, but the second opening has been summed up in percentile form.

TABLE 535

HEALY AND FERNALD PUZZLE BOX — TIME OF OPENING: SEX DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

PERCENTILES	15 yrs.	16 yrs.
5	0*	165
10	0*	358
15	0*	207
20	94*	144
25	187*	125
30	231*	96
35	266*	82
40	245	69
45	206	61
50	185	59
55	163	56
60	151	53
65	132	48
70	116	42
75	102	39
80	87	34
85	72	29
90	51	22
95	21	16

TABLE 536

HEALY AND FERNALD PUZZLE BOX — TIME OF OPENING: SEX DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

PERCENTILES	X		M	
	15 yrs.	16 yrs.	15 yrs.	16 yrs.
10	270*	105	0*	262*
20	371	63	86*	347
30	226	58	255*	186
40	186	62	347	115
50	153	58	298	78
60	119	48	209	53
70	82	43	166	48
80	56	33	123	33
90	35	19	101	26

* Values marked thus mean that one or both members of the comparison was merely failure at the end of the time limit.

The differences between the percentile scales of boys and girls at fifteen and sixteen years are presented in Table 535, and the differences between school (X) and working (M) children separately in Table 536. The percentage of complete failure at the end of the time limit was so large among girls that comparisons in the lowest percentiles are not significant in value. Each scale is marked to show the point below which comparisons merely mean reference to the arbitrary time limit set for the test. Thus in the fifteen-year comparisons for the entire group, the lowest 35 per cent of the girls failed and are graded 720″+, which is the limit for the test. At the fortieth percentile, real values appear in both scales and the time comparison becomes significant.

The tables show a very great and completely consistent superiority on the part of boys in both years, and among both groups—working children and school children. The superiority of working boys over working girls is greater than that of school boys over school girls. The differences in all of the scales are much larger in the upper than in the lower half. From the point on the scale where comparisons are valid in terms of time, the sex difference decreases steadily as the scale is ascended. Though the superiority of boys is unquestioned at every level, there is less difference between superior boys and superior girls than there is between inferior ones.

The percentage of success in closing the box at sixteen years also illustrates the great superiority of boys over girls (see Chapter V, Puzzle Boxes). Forty per cent of the boys succeeded in closing the box, with a median time of 255 seconds, whereas only 22 per cent of the girls succeeded in closing the box, with a median time of 306 seconds.

At seventeen years the type of puzzle box used—the Hayes box—represented not ability to solve an original problem, but ability to carry out instructions, using a mechanical device as the medium and a diagram as the method of giving instructions. The results are recorded in terms of the number of trials required to open the box. More than three trials was counted a failure. The differences are thus necessarily very small numerically.

The differences between the percentile scales for the entire group are presented in Table 537, and those for school (X) and working (M) children separately in Table 538. The scales show a very slight superiority of boys in the lower part of the scale, but no sex difference above the thirtieth percentile. What little difference there is appears in the working group. There is no sex difference in this test among school children.

Since percentile distributions based on a scale of only four divisions are at best an unsatisfactory basis of comparison, the table of percentage of success on the various trials is presented (Table 539).

The superiority of the boys in having a smaller percentage of failures and third trials than the girls, and a larger percentage of successes in one

TABLE 537

HAYES INSTRUCTION BOX — NUMBER OF TRIALS FOR SUCCESSFUL OPENING: SEX DIFFERENCES BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	17 yrs.	Percentiles	17 yrs.
5	0*	55	0
10	0*	60	0
15	0*	65	0
20	0	70	0
25	1	75	0
30	1	80	0
35	0	85	0
40	0	90	0
45	0	95	0
50	0		

TABLE 538

HAYES INSTRUCTION BOX — NUMBER OF TRIALS FOR SUCCESSFUL OPENING: SEX DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

Percentiles	X — 17 yrs.	M — 17 yrs.
10	1	0*
20	0	0*
30	0	1
40	−1	1
50	0	0
60	0	0
70	0	1
80	0	0
90	0	0

TABLE 539 — SUCCESSES AND FAILURES IN OPENING THE HAYES INSTRUCTION BOX

Trials	Boys		Girls	
	No. of Cases	Per Cent	No. of Cases	Per Cent
1	199	43	153	42
2	167	36	97	27
3	63	14	58	16
Failure	35	7	53	15
Totals	464	100	361	100

---

* Values marked thus mean that one or both members of the comparison was merely failure at the end of the number of trials allowed.

or two trials, is evident in this table. The proportion of successes on the first trial is practically the same for the two sexes.

The Freeman puzzle box was given at eighteen years. With a time limit of five minutes, the proportion of failures was very large. Fifty per cent of the girls failed. Numerical comparisons are, therefore, possible only in the upper half of the scale. The superiority of the boys is large and perfectly consistent (Table 540). Only 30 per cent of them failed. The time required for those who succeeded was far less than in the case of the girls. The difference in time decreases rapidly as the scale is ascended, but remains, even at the top, very much in favor of the boys. The sex difference seems even greater among working than among school children (Table 541).

TABLE 540

FREEMAN PUZZLE BOX — TIME OF OPENING: SEX DIFFERENCES IN SECONDS BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	18 yrs.	Percentiles	18 yrs.
5	.0*	55	128.5
10	.0*	60	102.8
15	.0*	65	100.7
20	.0*	70	74.9
25	.0*	75	71.6
30	.0*	80	51.5
35	28.0*	85	35.7
40	64.9*	90	33.3
45	94.7*	95	25.6
50	122.3*		

TABLE 541

FREEMAN PUZZLE BOX — TIME OF OPENING: SEX DIFFERENCES IN SECONDS BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

Percentiles	X — 18 yrs.	M — 18 yrs.
10	.0*	.0*
20	39.0*	.0*
30	124.0*	.0*
40	141.0	36.3*
50	119.0	98.9*
60	81.0	36.2
70	52.0	105.0
80	35.7	77.5
90	28.7	38.0

* Values marked thus mean that one or both members of the comparison was merely failure at the end of the time limit set.

Recognition

The results of the recognition test are presented in terms of the percentage of correct responses and of the number of each type of error—positive and negative. The differences in the percentile scales for the entire group of boys and girls are given in Table 542, and those for school children (X) and working children (M) separately in Table 543. Boys are consistently superior to girls in recognition. The type of error which makes the girls inferior is the positive error. Girls make more positive errors than boys, with the result that boys rank as superior to girls in positive errors. In terms of negative errors there is a smaller sex difference, and what little there is, is in favor of the girls. Boys make slightly more negative errors than girls. A comparison of the two groups of children shows that school boys are more superior to school girls than working boys are to working girls. Moreover, the sex difference in terms of positive error is much greater in the school group. School boys, then, gain their greater degree of advantage by making fewer positive errors. So far as negative errors are concerned, the girls have a slight advantage in both groups. Boys make more negative errors than girls.

TABLE 542

RECOGNITION — PER CENT CORRECT AND TYPE OF ERROR: SEX DIFFERENCES BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	Per Cent Correct	Positive Error	Negative Error
5	2.3	0	0
10	5.3	1	0
15	7.9	1	0
20	7.5	1	0
25	7.4	0	0
30	6.7	1	0
35	5.0	1	0
40	3.4	0	0
45	2.5	0	0
50	1.5	0	0
55	.8	1	0
60	.9	0	-1
65	1.1	0	0
70	1.2	0	0
75	1.8	1	0
80	1.3	0	0
85	.5	0	0
90	.8	1	0
95	2.6	0	0

TABLE 543

RECOGNITION — PER CENT CORRECT AND TYPE OF ERROR: SEX DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

Percentiles	X			M		
	Per Cent Correct	Positive Error	Negative Error	Per Cent Correct	Positive Error	Negative Error
10	9.4	2	−1	5.4	0	0
20	3.5	1	0	7.8	0	0
30	5.6	1	0	8.5	0	0
40	5.2	1	0	6.6	0	−1
50	4.6	1	−1	3.9	0	0
60	5.7	1	0	1.3	0	0
70	5.8	0	0	1.6	1	−1
80	5.9	1	0	2.3	0	−1
90	3.1	0	0	.0	0	0

The tendency of girls to make more positive errors and of boys to make more negative ones suggests that girls have more of a tendency to respond to suggestion and boys more of a tendency to resist suggestion. It may mean, however, that in case of doubt girls are somewhat more apt to give themselves the benefit, whereas boys refuse to take the benefit and respond only to a fair degree of certainty.

AUSSAGE

The differences between the percentile scales for the two sexes in terms of percentage of correct memories in the *Aussage* test is given in Table 544 for the entire group, and in Table 545 for school (X) and working (M) children separately. The sex difference is small and inconsistent. It is in favor of the boys in the lower half of the scale and of the girls in the upper half. This tendency is evident both among school (X) and among working (M) children. However, on the whole, school girls and working boys are superior. In reporting the type of content represented in this test, then, one would expect to find men more reliable among rather inferior people and women more reliable among the superior types. *Aussage* tests are probably modified in result according to the type of material selected for report. The passage used in this case contained more of an appeal for boys than for girls. It would probably be possible to select a passage of equal difficulty but different content which would reverse this small sex difference. In general comparisons of sex based on *Aussage* tests have given inconsistent results.

TABLE 544 — AUSSAGE TEST — PER CENT OF CORRECT MEMORIES: SEX DIFFERENCES BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	18 yrs.	Percentiles	18 yrs.
5	7.8	55	− .2
10	6.9	60	−1.1
15	5.0	65	−1.4
20	4.7	70	−1.8
25	4.9	75	−2.0
30	5.0	80	−1.1
35	3.3	85	.4
40	3.5	90	− .6
45	2.2	95	− .3
50	.8		

TABLE 545 — AUSSAGE TEST — PER CENT OF CORRECT MEMORIES: SEX DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

Percentiles	18-X	18-M
10	4.6	8.6
20	.0	5.9
30	−1.1	6.3
40	− .3	5.8
50	−1.7	5.1
60	−2.8	2.0
70	−3.6	− .2
80	−1.6	− .1
90	−1.3	1.3

Hard Directions

The sex differences in the hard-instructions test can be stated in terms of the time required to complete the test and of the number of correct responses out of a possible total of twenty. The differences between the percentile scales for the whole group of boys and girls are presented in Table 546. Those for school (X) children and working (M) children separately are given in Table 547. In this test girls are superior to boys, both in terms of the time required and in terms of the correctness of performance. The superiority of working girls over working boys is much more marked in both measures—time and accuracy—than the superiority of school girls over school boys. In the working group there is a marked tendency for the differences to be larger at the lower than at the upper end of the scale. The working girls who are poor in this type of performance show more superiority to working boys who are poor than the working girls who are good do to boys who are good. In the school series the differences are similar in order at the two ends of the scale.

TABLE 546

HARD DIRECTIONS — TIME IN SECONDS AND NUMBER CORRECT: SEX DIFFERENCES BETWEEN THE FIVE-PERCENTILE SCALES

Boys — Girls

Percentiles	Time	No. Correct
5	−75.4	−3
10	−78.7	−3
15	−65.9	−2
20	−56.6	−2
25	−44.1	−2
30	−38.0	−3
35	−43.6	−1
40	−33.0	−1
45	−29.5	−2
50	−29.2	−1
55	−29.8	−2
60	−27.8	−1
65	−24.7	−2
70	−22.6	−1
75	−25.2	−1
80	−23.6	−1
85	−21.2	−1
90	−18.4	0
95	− 6.3	−1

TABLE 547

HARD DIRECTIONS — TIME IN SECONDS AND NUMBER CORRECT: SEX DIFFERENCES BETWEEN THE TEN-PERCENTILE SCALES

Boys — Girls

Percentiles	Time		No. Correct	
	18-X	18-M	18-X	18-M
10	4.5	−78.0	0	−2
20	10.0	−56.8	0	−3
30	4.0	−36.3	−1	−2
40	− 1.2	−29.6	0	−2
50	−12.0	−29.2	−1	−1
60	−11.7	−24.3	0	−1
70	− 8.1	−24.4	0	−1
80	1.8	−18.3	−1	−1
90	7.5	−15.4	0	−1

Variability of the Sexes

In the literature of sex comparisons there has been much discussion of the question as to whether the male or the female sex were the more variable. The doctrine that males were more variable, and that therefore both idiocy and genius were more apt to occur in the male sex, has been frequently stated, and as frequently disputed. The present series of tests offers an opportunity to formulate results in terms of variability.

TABLE 548 — COEFFICIENTS OF VARIABILITY: PHYSICAL TESTS

$$\left(V = \frac{Q \times 100}{M}\right)$$

	Years				
	14	15	16	17	18
Height					
Boys	3	4	3	3	2
Girls	3	3	2	2	2
Weight					
Boys	12	12	10	8	8
Girls	10	9	9	9	8
Vital Capacity					
Boys	13	14	13	12	13
Girls	11	13	11	11	11
Taps Right 30″					
Boys	7	8	8	8	7
Girls	7	6	7	7	5
Taps Left 30″					
Boys	9	8	9	9	8
Girls	9	8	8	7	7
Taps Right 60″					
Boys	8	8	8	8	7
Girls	7	7	6	7	5
Taps Left 60″					
Boys	9	8	9	9	8
Girls	9	8	8	8	7
Grip Right					
Boys	14	18	16	12	10
Girls	14	11	11	9	10
Grip Left					
Boys	14	17	14	12	10
Girls	13	12	12	10	10
Card-Sorting—Time					
Boys	12	11	11	10	11
Girls	10	11	9	9	10
Card-Sorting—Index					
Boys	12	12	11	11	11
Girls	12	11	9	10	11

As a measure of variability expressed in terms of central tendency, we have used a type of quotient of variability first formulated by Pearson and later adopted for use with data formulated in terms of medians and quartiles. It consist in the ratio between Q and the median, expressed in percentage. The formula is as follows: $\left(V=\frac{Q\times 100}{M}\right)$*. Table 548 shows the coefficients of variability for the two sexes in physical tests at each year from fourteen to eighteen. There is no instance at any age in which girls show greater variability in physical tests than boys. Furthermore, in each physical measure, boys, at one or another year, show greater variability than girls. At two age levels—sixteen and seventeen—coefficients are higher for boys than for girls without exception. Year fifteen also shows higher coefficients among boys to be the rule. At year fourteen and year eighteen, however, boys have higher coefficients in only about half the measures. The much greater variability of years fifteen, sixteen, and seventeen is doubtless due to the enormously rapid growth and developmental changes of boys during those years.

At year eighteen, when both sexes are near an adult status, the relative variability of the sexes in physical measurements is as follows:

Height	no sex difference
Weight	no sex difference
Vital capacity	boys more variable
Strength of the hand	no sex difference
Rapidity of movement	boys more variable
Card-sorting	boys more variable in time, no sex difference in index

The general conclusion is that the series offers evidence for greater variability of the male sex in physical abilities during the years from fourteen to eighteen. Whether we are dealing with a permanent sex difference or merely with one which is conditioned by the rates of growth of the sexes during these adolescent years, remains to be seen.

The coefficients of variability in mental tests are given in Table 549. Since comparisons from the original table are difficult, a summary of the years in which, in each measure, coefficients are the same, greater in boys, or greater in girls, is presented in Table 550. A comparison of coefficients for the two sexes results as follows: in cancellation (index), the coefficients are the same during two years, larger for boys one year, and larger for girls two years. In concellation, then, no sex difference in variability appears. In substitution, boys are more variable on the learning pages and girls on the memory page. In memory, boys are on the whole more variable. At eighteen years all four measures of the test show greater

*See H. O. Rugg. *Statistical Methods Applied to Education*, pp. 175–177.

TABLE 549

COEFFICIENTS OF VARIABILITY: MENTAL TESTS

$$\left(V=\frac{Q\times 100}{M}\right)$$

	Years				
	14	15	16	17	18
Cancellation—Accuracy					
Boys	10	4	5	4	2
Girls	10	4	6	5	15
Cancellation—Index					
Boys	19	18	15	16	16
Girls	19	15	16	16	18
Substitution—Index					
Page 1 Boys	15	15	15	15	19
Girls	14	14	14	15	15
Page 2 Boys	18	18	18	17	18
Girls	18	16	18	17	16
Page 3 Boys	18	18	32	29	28
Girls	18	18	37	33	29
Page 4 Boys	27	27			
Girls	28	29			
Substitution—Accuracy					
Boys	7	6	8	7	6
Girls	7	5	9	9	6
Substitution—Sum					
Boys	15	15	15	15	15
Girls	15	14	14	14	14
Opposites—Easy					
Boys	9	15			5
Girls	9	15			4
Opposites—Hard					
Boys				37	25
Girls				41	23
Cause and Effect					
Boys			15		
Girls			15		
Mutilated Text—Time					
Boys				35	36
Girls				36	36
Mutilated Text—Accuracy					
Boys				32	26
Girls				25	26
Recognition—Per cent correct					
Boys					25
Girls					32
Recognition—Plus errors					
Boys					50
Girls					33

TABLE 549—*Continued*

	Years				
	14	15	16	17	18
Recognition—Minus errors					
Boys					100
Girls					100
Hard Instructions—Time					
Boys					25
Girls					27
Hard Instructions—Number correct					
Boys					17
Girls					18
Aussage					
Boys					14
Girls					20
Construction Puzzles—Flower-Pot					
Boys			43		
Girls			53		
Construction Puzzles—Chick					
Boys				57	
Girls				69	
Puzzle Boxes					
Boys	51	42	25		
Girls		51	50		
Memory—7-place					
Boys	7	5	4	4	4
Girls	7	5	3	3	3
Memory—8-place					
Boys	17	14	8	8	9
Girls	16	14	9	8	8
Memory—9-place					
Boys	18	19	16	15	16
Girls	18	17	14	15	12
Memory—Sum					
Boys	11	10	9	9	9
Girls	11	11	9	9	7
Sentences—Index of ideas					
Boys	27	28	28		
Girls	28	29	30		
Association—Time					
Sentences					
Boys	57	48	53		
Girls	55	60	49		
Sentences					
Number of ideas					
Boys	25	21	22		
Girls	18	20	20		
Sentences					
Number Correct					
Boys	9	5	4		
Girls	9	5	4		

variability of boys. In sentence completion, girls are more variable in index and in number of ideas, and boys in association time. In controlled association, including easy and hard opposites and cause and effect, there is no clear difference of sex. In three of the measures there is no difference in coefficient; in two, boys are more variable, and in one, girls are more variable. In mutilated text, boys are more variable. In recognition, hard directions, *Aussage*, and the flower-pot puzzle, girls are more variable. In the Healy and Fernald puzzle box there is no sex difference in variability.

TABLE 550 — COEFFICIENTS OF VARIABILITY

$$\left(V=\frac{Q\times 100}{M}\right)$$

	Years in Which Coefficients Are the Same, Greater for Boys, or Greater for Girls		
	Same	Boys+	Girls+
Cancellation—Index	14, 17	15	16, 18
Substitution—Index, P. 1	17	14, 15, 16, 18	
P. 2	14, 16, 17	15, 18	
P. 3	14, 15		16, 17, 18
P. 4			14, 15
Sum of practice pages	14	15, 16, 17, 18	
Memory—7-place	14, 15	16, 17, 18	
8-place	15, 17	14, 18	16
9-place	14, 17	15, 16, 18	
Sum	14, 16, 17	18	15
Sentences—Index			14, 15, 16
Association—Time		14, 16	15
No. of ideas		14	15, 16
Opposites—Easy	14, 15	18	
Hard		18	17
Cause and effect	16		
Mutilated Text—Time	18	17	
Per cent correct	18	17	
Recognition—Per cent correct			18
Hard Instructions—Time			18
No. correct			18
Aussage—Per cent correct			18
Flower-Pot			16
Puzzle Boxes—Healy and Fernald	15		

Our general conclusion must be that the series of mental tests offers no evidence of greater variability in one sex than in the other. There is a greater number of tests in which girls are more variable than of tests in which boys are more variable, but this might easily be due to the selection of tests.

The coefficient of variability used in the preceding section is based upon the difference between the seventy-five and the twenty-five percentiles. If a real difference in variability between the two sexes exists, one should logically expect to find it more clearly expressed when the extremes of the

TABLE 551

COEFFICIENTS OF VARIABILITY: PHYSICAL TESTS

$$\left(V = \frac{95-5}{2} \times \frac{100}{M}\right)$$

	Years				
	14	15	16	17	18
Height—					
Boys	17	18	16	12	12
Girls	13	12	13	12	12
Weight—					
Boys	59	54	52	39	37
Girls	50	52	50	42	48
Vital Capacity—					
Boys	74	65	62	54	52
Girls	65	55	57	52	58
Strength of the Hand—Right					
Boys	79	78	74	56	51
Girls	65	52	55	55	52
Strength of the Hand—Left					
Boys	77	73	71	58	51
Girls	65	59	55	54	57
Taps 30″—Right					
Boys	46	41	41	41	37
Girls	34	34	33	32	35
Taps 30″—Left					
Boys	46	43	47	47	43
Girls	41	42	40	39	42
Taps 60″—Right					
Boys	39	33	39	45	39
Girls	31	32	32	33	34
Taps 60″—Left					
Boys	45	43	48	44	42
Girls	44	40	39	38	39
Card-Sorting—Time					
Boys	58	57	56	49	59
Girls	51	51	45	47	52
Card-Sorting—Index					
Boys	59	57	57	56	61
Girls	55	57	47	51	56

percentile range were considered than when the central range alone was made the basis of computation. The difference between the ninety-five and the five percentiles can be formulated with reference to the median just as readily as the difference between the seventy-five and the twenty-five percentiles. If a real difference in variability exists, the formula $\frac{95-5}{2}\times\frac{100}{M}$ should give larger and more consistent coefficients of variability in favor of the more variable sex than the formula $\frac{75-25}{2}\times\frac{100}{M}$ which was used in the preceding section. To test the matter, the coefficients based upon the difference between the ninety-five and the five percentiles were estimated and are presented in Table 551 for the physical tests. The chief difference between this set of coefficients and the previous ones is that at age eighteen girls now show greater variability than boys in three measures: weight, vital capacity, and strength. Boys are more variable in rapidity and card-sorting, and the two sexes are the same in variability of height. Below the age of eighteen, boys remain more variable in all measures except weight. The result of this added bit of evidence is to make it appear less certain that adult males display greater variability in physical measurements than adult females. The greater variability during the years fourteen to seventeen may be merely expressions of the rapid and variable physical growth of boys of those ages. The adolescent period is a poor one on which to depend for data about physical variability.

The corresponding set of coefficients for the series of mental tests is given in Table 552. The instances in which coefficients are the same for the two sexes, greater for girls, or greater for boys are summed up in Table 553. The new set of coefficients shows many instances of disagreement with the previous set. In cancellation and controlled association no difference in variability appeared in the previous set of coefficients, while boys have the larger quotients in this set. In substitution (practice pages), boys had the higher coefficient in the first set and girls in this one. In hard directions, boys had the higher coefficient in the previous computation and girls in this one. In mutilated text, boys had the higher coefficient in the first table and girls in the second. In memory, boys have the higher coefficient both times, and in recognition, *Aussage*, and practice pages of the substitution test, girls have the higher coefficient both times. The number of instances in which the second computation reverses the dictum of the first, and the fact that when the ninety-five and five percentiles are used there is still less tendency for a sex difference in variability to appear than when the seventy-five and twenty-five percentiles were used, lead us to the conclusion that so far as the present series of mental tests is concerned, no sex difference in variability is discernible.

TABLE 552

COEFFICIENTS OF VARIABILITY: MENTAL TESTS

$$\left(V=\frac{95-5}{2}\times\frac{100}{M}\right)$$

	Years				
	14	15	16	17	18
Substitution—Index Page 1					
Boys	75	77	74	75	76
Girls	78	76	78	83	82
Substitution—Index Page 2					
Boys	84	92	84	83	91
Girls	81	82	93	95	102
Substitution—Index Page 3					
Boys	92	98	234	221	211
Girls	90	81	230	228	237
Substitution—Index Page 4					
Boys	194	197			
Girls	200	196			
Substitution—Accuracy					
Boys	41	39	43	32	33
Girls	41	38	52	47	42
Substitution—Sum					
Boys	72	74	71	69	74
Girls	75	79	74	77	76
Memory—7-place					
Boys	37	33	25	28	28
Girls	39	29	23	28	31
Memory—8-place					
Boys	66	58	46	45	44
Girls	65	57	45	41	38
Memory—9-place					
Boys	81	75	66	63	64
Girls	78	75	66	61	53
Memory—Sum					
Boys	55	49	37	42	42
Girls	54	47	36	37	34
Cancellation—Accuracy					
Boys	52	21	27	24	13
Girls	53	21	29	29	13
Cancellation—Index					
Boys	104	79	82	81	75
Girls	101	78	81	85	69
Opposites—Easy					
Boys	62	76			30
Girls	67	84			25

TABLE 552—*Continued*

	14	15	16	17	18
Opposites—Hard					
Boys				162	116
Girls				151	96
Cause and Effect					
Boys			71		
Girls			66		
Sentences—Index					
Boys	165	165	172		
Girls	148	170	178		
Sentences—Association time					
Boys	223	179	206		
Girls	217	212	189		
Sentences—No. of ideas					
Boys	114	120	104		
Girls	106	100	99		
Sentences—No. correct					
Boys	43	33	30		
Girls	40	35	26		
Mutilated Text—Time					
Boys				114	123
Girls				162	174
Mutilated Text—Accuracy					
Boys				128	108
Girls				129	109
Recognition—Per cent correct					
Boys					135
Girls					140
Recognition—Plus errors					
Boys					200
Girls					200
Recognition—Minus errors					
Boys					300
Girls					300
Hard Directions—Time					
Boys					149
Girls					136
Hard Directions—Number correct					
Boys					80
Girls					63
Aussage—Accuracy					
Boys					81
Girls					95

TABLE 553

COEFFICIENTS OF VARIABILITY

$$\left(V=\frac{95-5}{2}\times\frac{100}{M}\right)$$

	Years in Which Coefficients Are the Same, Greater for Boys, or Greater for Girls		
	Same	Boys+	Girls+
Cancellation—Index		14, 15, 16, 18	17
Substitution—Index, Page 1		15	14, 16, 17, 18
Page 2		14, 15	16, 17, 18
Page 3		14, 15, 16	17, 18
Page 4		15	14
Sum of practice pages			14, 15, 16, 17, 18
Memory—7-place	17	15, 16	14, 18
8-place		14, 15, 16, 17, 18	
9-place	15, 16	14, 17, 18	
Sum		14, 15, 16, 17, 18	
Sentences—Index		14	15, 16
Association—Time		14, 16	15
No. of Ideas	15	14, 16	
Opposites—Easy		18	14, 15
Hard		17, 18	
Cause and Effect		16	
Mutilated Text—Time			17, 18
Per cent correct			17, 18
Recognition—Per cent correct			18
Hard Instructions—Time		18	
No. correct		18	
Aussage—Per cent correct			18

SUMMARY OF CHAPTER VII

I. (1) The sex differences in physical measurements are marked and sufficiently large to be of importance. In size, though there is a slight superiority of girls at fourteen, boys gain so much more between the ages of fourteen and eighteen that by eighteen they are very superior. In vital capacity, strength, and mere rapidity of movement, boys are superior to girls at every year from fourteen to eighteen, and their degree of superiority increases from year to year up to eighteen. In steadiness, girls are superior at fourteen and fifteen and boys at seventeen and eighteen, except for the fact that in the top ten-percentile group girls remain superior up to eighteen. In card-sorting girls are superior each year. Their degree of superiority decreases slightly from fourteen to eighteen. Left-handedness is more frequent in boys than in girls, whether the indication of it is sought in strength, steadiness, or rapidity. Boys are superior to girls in all of the simplest and most elementary physical abilities measured. It is not until speed in a complex process like card-sorting is reached, in which rapid eye-hand coördinations are demanded, that girls show superiority. The superiority of boys in height, weight, vital capacity, and strength has been established in many a previous study, whose results are summed up by Whipple (1) and Baldwin (2). The facts with regard to steadiness and a coördination test like card-sorting are not so well attested.

(2) The differences between school boys and girls in physical tests are not the same as those between working boys and girls. School boys are physically far more superior to working boys than school girls are to working girls. This distinction is shown in two ways: First, school boys are superior to working boys in size (height and weight) whereas school girls are not superior to working girls; second, in measurements of skill, the degree of superiority of school boys over working boys is greater in every instance than the degree of superiority of school girls over working girls.

II. (1) In mental tests the differences are smaller and less consistent. In cancellation, which makes much the same type of demand as card-sorting—a rapid eye-hand coördination—girls are clearly superior at every age, as they were in card-sorting. In immediate rote memory, girls are also somewhat superior. The practice part of the substitution test, which is again an eye-hand coördination test somewhat comparable to cancellation and card-sorting, shows a slight, though fairly consistent, superiority of girls. The memory page shows inconsistent results. Girls tend to have both the best and the worst records.

In tests in which the use of language and logical verbal association processes are concerned, such as completion of sentences, mutilated text, association by opposites, cause and effect, and hard instructions, girls are superior, though the differences are small as compared with differences between working children and school children. In all of the tests involving types of mechanical ingenuity, such as construction puzzles, the Healy and Fernald box (both opening and closing), and the Freeman box, boys are very superior to girls. The differences are of a similar order to those between working and school children. In a mechanical type of test involving not ingenuity but ability to understand and carry out instructions, such as that presented by the Hayes box, boys are very little superior to girls. In the one test of purely visual perception and recognition—the so-called recognition test—boys are superior. This capacity seems related to their superior ability in manipulating the visual content of the construction-puzzle tests. In the *Aussage* test, the sex difference is not consistent—girls have both the best and the worst records. In other words, superior girls are better than superior boys, but inferior boys are better than inferior girls—a result which may be conditioned by the content of this particular test.

The large literature of the comparative psychology of sex has been excellently summed up by Lipmann (3). Previous summaries in English by Hollingworth (4) and by Woolley (5) are available. For the tests treated in Whipple's Manual (1) comparisons of sex are given in discussing each test. Every year adds to the mass of experimental data. While there are contradictory findings, the results of this study agree with the consensus of previous work. The feminine sex usually appears to be somewhat superior in immediate memory, in coördination tests such as card-sorting, cancellation, and substitution, and in tests in which logical verbal associations are the chief requirement, such as association by opposites, cause and effect, and hard directions. The male sex has been found to be very superior in tests of logical thinking in which manipulation of objects is required, such as construction puzzles and puzzle boxes. In tests of logical memory and report, sex differences have been small and contradictory. The sex differences are most of them very small in comparison with differences found between the superior and the inferior members of the same sex.

(2) Mentally as well as physically, school boys compare more favorably with school girls than working boys do with working girls, though the tendency is not so clear in terms of mental tests. In

tests in which girls are superior, the sex difference tends to be greater in the working than in the school group.

III. No consistent sex difference in variability can be shown, either in physical or in mental tests. The fact that boys are much more variable than girls in physical capacities during the years fourteen to seventeen is probably due to the fact that those years constitute a period in which boys are found in all stages of development from pre-pubescent to adult levels. Henmon and Livingston (6) found that in physical traits adolescents showed greater variability than children. Mental traits, on the other hand, they found less variable in adolescence than in childhood. In our series the girls were for the most part post-adolescent and the boys adolescent. As they both reached maturity, variability tended to be the same for both in both types of test. Frasier (7), in a study based upon the school-grade location of a very large number of thirteen-year-old children, found no difference between the sexes in variability, when the basis computation was the difference between the second and the ninety-eighth percentile, as related to the median. When the difference between the twenty-fifth and the seventy-fifth percentile was related to the median, a slightly greater variability of boys appeared. The result is similar to ours, when we found the degree of variability of the males decreased rather than increased by using the fifth and ninety-fifth percentiles as a basis of computation instead of the twenty-fifth and seventy-fifth. School-grade location, which Frasier used as a measure, is very little affected by spurts of adolescent growth, but is rather determined by the rate of development of the individual over a considerable period of years. Accordingly, the fact that boys and girls of thirteen years are in different stages with reference to adolescence would probably not affect his results with regard to variability.

References

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(2) Baldwin, Bird T.—*The Physical Growth of Children from Birth to Maturity.* Iowa City: University of Iowa, 1922.

(3) Lipmann, Otto—"Psychische Geschlechtsunterschiede, Ergebnisse der Differentiellen Psychologie," *Zeitschrift fuer Angewandte Psychologie*, 1917, Beihefte 14a, 14b.

(4) Hollingworth, Leta S.—"Comparison of the Sexes in Mental Traits," *Psychological Bulletin*, 1918, XV, 427–432.

(5) Woolley, Helen Thompson—"The Psychology of Sex," *Psychological Bulletin*, 1914, II, 353–379.

(6) Henmon, V. A. C. and Livingston, W. F.—"Comparative Variability at Different Ages," *Journal of Educational Psychology*, 1922, XIII, 17–29.

(7) Frasier, G. W.—"A Comparative Study of Variability of Boys and Girls," *Journal of Applied Psychology*, 1919, III, 151–155.

CHAPTER VIII

THE RELATION OF MENTAL AND PHYSICAL ABILITY TO SCHOOL GRADE COMPLETED DURING THE FIRST FOUR YEARS OF INDUSTRY

SECTION I: TEST RECORDS IN RELATION TO SCHOOL GRADE DURING THE FIRST FOUR YEARS OF WAGE-EARNING

A previous study of the group of working children (1) has shown that there is a relation between ability in physical and mental tests and school grade completed at fourteen years. The upper-grade children are somewhat superior in tests of physical ability, and very superior in tests of mental ability. That these differences in the case of mental tests are maintained from year to year among children who remain in school is well-established by a mass of experimental evidence. Information with regard to the relation between physical ability and school grade completed at a given age is not so plentiful. Information as to whether the differences among school children are maintained from year to year after leaving school or tend to disappear under the conditions of industrial life, is still less plentiful. The purpose of this chapter is to discover whether the differences, mental and physical, which were found at fourteen years between children entering industrial life from grades five, six, seven, and eight, are as distinct at eighteen as they were at fourteen, or whether they tend to become equalized as the school recedes and the very different action of industrial selection comes into play. In the school-grade classification of this chapter, the few children who had completed the ninth grade are included with the eighth grade.

Median Records in Physical and Mental Tests by School Grade Completed at Fourteen and at Eighteen Years

The comparison of separate test records at fourteen and at eighteen years has been undertaken only in terms of medians for each test. Furthermore, the method is applicable only to tests which were repeated from year to year. Since the physical tests were all maintained throughout the five annual tests, a complete set of comparisons is available. In the case of the mental tests, only cancellation, memory, and substitution were repeated from year to year. The easy-opposites test was given at fourteen and at eighteen years, and is included in the table.

The median in each physical test of boys for each school grade, at fourteen and at eighteen years, is presented in Table 554. In height and in weight, the progression from grade to grade is regular except that sixth-grade boys at fourteen are a bit shorter and lighter than the fifth-grade.

At eighteen the progression is regular from grade to grade. At fourteen, eighth-grade boys are 2 centimeters taller than those of the fifth grade, and at eighteen they are 2.4 centimeters taller. At fourteen, eighth-grade boys are 1.3 kilograms heavier than fifth-grade boys, and at eighteen they are 1.7 kilograms heavier. In vital capacity there is a regular increase from grade to grade at fourteen years, and an increase at eighteen from fifth to seventh grade, with the eighth-grade record the same as the seventh-grade. At fourteen, eighth-grade boys had a vital capacity 118 ccs. greater than that of fifth-grade boys, and at eighteen a record 182 ccs. greater than that of the fifth-grade. In strength of the hand, the differences from grade to

TABLE 554

MEDIAN TEST RECORDS OF WORKING BOYS AT 14 AND AT 18 YEARS BY SCHOOL GRADE COMPLETED

Physical Tests

	Year	Grade V	Grade VI	Grade VII	Grade VIII
Height (cms.)	14	151.5	150.6	152.5	153.5
	18	170.8	171.0	171.4	173.2
Weight (kg.)	14	40.9	40.0	41.1	42.2
	18	59.5	59.8	60.4	61.2
Vital capacity (cc.)	14	2227	2237	2265	2345
	18	3429	3567	3611	3611
Strength of the hand (kg.)					
Right	14	25.0	25.6	25.6	26.0
	18	45.2	46.4	46.0	45.6
Left	14	24.4	25.4	25.2	25.0
	18	42.8	44.9	44.6	45.2
Steadiness (holes and contacts)					
Right	14	IV-12	IV-11	IV-10	IV-12
	18	VII-9	VII-8	VII-8	VII-9
Left	14	III-8	III-6	III-6	III-7
	18	VI-10	VI-9	VI-8	VI-10
Rapidity—					
Taps in 30 seconds					
Right	14	170	173	172	172
	18	191	187	189	193
Left	14	139	143	142	142
	18	169	166	172	170
Taps in 60 seconds					
Right	14	310	310	323	324
	18	359	351	357	367
Left	14	263	263	264	267
	18	301	299	302	308
Card-sorting					
Time	14	52.0	49.7	48.2	45.1
	18	42.8	39.3	38.4	38.0
Index	14	53.5	51.7	49.7	44.9
	18	43.5	40.2	38.8	38.5

grade are very small and irregular. At both ages and with both hands, the eighth-grade boys are stronger than the fifth grade, but the sixth- and seventh-grade boys exceed the eighth-grade boys with the right hand at eighteen and with the left hand at fourteen. With the right hand, the eighth-grade boys are 1 kilogram ahead of the fifth-grade boys at fourteen and 0.4 of a kilogram ahead at eighteen. With the left hand, the eighth grade is 0.6 of a kilogram ahead at fourteen and 2.4 kilograms ahead at eighteen. Steadiness shows no regular relation to school grade. The eighth-grade record in each case is the same as the fifth-grade, while the sixth- and seventh-grade records are somewhat better than either. The interesting point to note is the constancy of the grade groups in relation to one another. While the increase in steadiness from fourteen to eighteen is large in amount —three holes—nevertheless the relative position of the grade groups at eighteen remains almost exactly the same as at fourteen years. In rapidity the situation is much the same as in strength. There is not a regular increase from grade to grade. In every instance the eighth grade has a higher record than the fifth. In the 30-second period the best record falls in the sixth or seventh grade three times in the four. It is interesting that for the 60-second period when endurance counts for more, the eighth grade has the best record in all four instances. The situation at eighteen is very similar to that at fourteen, though there is no such close similarity in the relative records of the grades at the two ages as in the case of steadiness. In card-sorting there is a perfectly regular improvement from grade to grade in both time and accuracy, and at both ages. In time, the eighth-grade record is 6.9 seconds ahead of the fifth-grade at fourteen years, and 4.8 seconds ahead at eighteen years. In index, the eighth-grade record is 8.6 seconds ahead of the fifth-grade at fourteen years, and 5.0 seconds ahead at eighteen years. The diversity of the grades is thus somewhat greater at fourteen than at eighteen. One explanation lies in the fact that the fifth grade improved somewhat more rapidly than the eighth.

Our general conclusion is that while differences from grade to grade in the physical tests of boys are small, they bear a definite and positive relation to the grade completed at fourteen years, and the relation is as distinct and very similar in kind at eighteen years. Four years of industrial experience have not tended to obliterate the difference in ability between the grade groups.

The results for the four mental tests that could be treated by the same method are presented in Table 555. In cancellation there is a steady improvement from grade to grade, both in index and in accuracy at fourteen years. At eighteen years the seventh-grade boys have a better record than the eighth-grade in both measures. At fourteen years the index of the eighth grade is 32 seconds better than that of the fifth grade, while at eighteen years it is only 7 seconds better. In accuracy at fourteen the eighth grade is 15 points ahead of the fifth, while at eighteen years it is only 6.9 points ahead. In memory the relation to school grade is perfect in all four measures—seven-place, eight-place, and nine-place series, and the sum of the three. It is just as distinct at eighteen as it was at fourteen. In the seven- and eight-place series, there is an arbitrary upper limit of 100 per cent which makes the exact amount of gain deceptive. In the nine-place series, the eighth grade is 16.8 points ahead of the fifth at fourteen years, and 29.2 points ahead at eighteen years. Though every group has improved its record decidedly during the four years, the improvement is so similar for all groups that the general relationship of the groups is maintained. In substitution, the improvement with school grade is even more regular at eighteen years than it had been at fourteen. On the two copying pages, there are irregularities in the improvement from grade to grade at

TABLE 555

MEDIAN RECORDS OF WORKING BOYS AT 14 AND AT 18 YEARS BY SCHOOL GRADE COMPLETED

Mental Tests

	Year	Grade V	Grade VI	Grade VII	Grade VIII
Cancellation					
Index	14	239	222	208	207
	18	153	154	139	146
Accuracy	14	75.5	83.2	85.8	90.5
	18	77.1	79.8	89.4	84.0
Memory					
7-place	14	86.3	90.7	91.5	94.6
	18	91.3	92.3	100	100
8-place	14	67.7	74.8	79.3	85.6
	18	81.3	91.9	93.7	100
9-place	14	58.2	65.0	70.0	75.0
	18	63.1	78.3	86.1	92.3
Sum	14	197	220	230	251
	18	250	267	278	288
Substitution Index in seconds					
Page 1	14	193	193	164	176
	18	144	137	132	120
Page 2	14	146	127	127	124
	18	120	111	108	99
*Memory page	14	122	111	104	97
	18	122	99	100	96
Accuracy of memory page	14	93.6	100	100	100
	18	91.0	96.7	95.8	97.3
Easy opposites					
Per cent accuracy	14	79.4	88.2	83.6	90.8
	18	88.9	92.7	84.7	95.0

*The memory page of year fourteen was written after three practice pages, and that of year eighteen after only two.

fourteen years, but none at eighteen years. In the index of page 1, the eighth grade at fourteen years is 17 seconds ahead of the fifth, and at eighteen years it is 24 seconds ahead. On page 2, the eighth-grade index is 22 seconds ahead of the fifth grade at fourteen years, and 21 seconds ahead at eighteen years. On the summary page, the eighth-grade index is 25 seconds ahead of the fifth-grade at fourteen years, and 26 seconds ahead at eighteen years. On the memory page, the eighteen-year series is but slightly better than the fourteen-year in index, but it must be borne in mind that the fourteen-year memory record was preceded by three practice pages and the eighteen-year record by but two. The greater amount of

TABLE 556

MEDIAN TEST RECORDS OF WORKING GIRLS AT 14 AND AT 18 YEARS—BY SCHOOL GRADE COMPLETED

PHYSICAL TESTS

	Year	Grade V	Grade VI	Grade VII	Grade VIII
Height (cms.)	14	152.7	155.8	155.3	157.5
	18	161.4	160.4	162.7	160.3
Weight (kg.)	14	44.8	44.1	44.4	43.5
	18	54.2	53.7	53.8	54.7
Vital capacity (cc.)	14	2167	1997	1991	2139
	18	2401	2401	2445	2512
Strength of the hand (kg.)					
Right	14	23.5	25.3	24.2	23.9
	18	28.7	28.4	29.4	28.4
Left	14	22.6	22.9	22.6	23.3
	18	27.4	27.4	27.9	25.9
Steadiness (holes and contacts)					
Right	14	IV-8	IV-9	IV-10	IV-1
	18	VI-8	VII-10	VII-9	VI-0
Left	14	IV-12	III-3	III-4	III-3
	18	V-0	VI-12	VI-11	VI-9
Rapidity—					
Taps in 30 seconds					
Right	14	166	163	167	172
	18	177	179	181	187
Left	14	136	140	143	144
	18	154	153	151	157
Taps in 60 seconds					
Right	14	305	309	308	322
	18	341	340	347	357
Left	14	249	270	265	264
	18	282	293	290	300
Card-sorting					
Time	14	46.1	44.8	44.0	42.0
	18	38.1	37.2	37.1	35.4
Index	14	46.9	46.2	44.9	42.5
	18	38.3	37.6	37.4	35.9

practice at fourteen is responsible for the fact that the accuracy of the memory page at the younger age is greater than at the older age. No comparisons from grade to grade in accuracy are possible because at fourteen the three upper grades had a median of 100 per cent. At both ages the fifth grade has the poorest record, and at eighteen the eighth grade has the best one. In this case, then, there is even more striking evidence of a positive relationship between school grade completed and test results at eighteen years, after four years in industry, than there was at fourteen years when the children were only just leaving school. In easy opposites the basis of comparison is poor because all of the records were so near perfection. The test was too easy to discriminate abilities well. At both years the eighth grade has the best record. In both years the seventh grade is poorer than the sixth. While the relationship to school grade is not perfect in either year, it is similar in the two cases.

TABLE 557

MEDIAN TEST RECORDS OF WORKING GIRLS AT 14 AND 18 YEARS — BY SCHOOL GRADE COMPLETED

MENTAL TESTS.

	Year	Grade V	Grade VI	Grade VII	Grade VIII
Cancellation					
Index	14	206	210	192	179
	18	132	134	122	100
Accuracy	14	77.1	79.8	89.4	84
	18	100	100	100	100
Memory					
7-place	14	83.0	91.0	92.2	100
	18	91.1	94.1	100	100
8-place	14	68.3	78.0	77.1	96.8
	18	85.1	90.6	93.7	100
9-place	14	58.4	65.3	69.8	80.4
	18	72.2	81.0	84.5	92.8
Sum	14	206	219	237	259
	18	254	264	272	290
Substitution—Index in seconds					
Page 1	14	174	177	156	144
	18	137	139	130	128
Page 2	14	139	140	126	117
	18	115	108	105	96
Memory page	14	128	114	106	104
	18	116	109	101	76
Accuracy of memory page	14	94.9	95.9	100	100
	18	95.0	95.0	95.0	97.0
Easy opposites—per cent accuracy	14	79.8	86.5	91.4	93.7
	18	90.0	93.0	93.7	96.1

In the case of mental tests of boys, then, we find more striking evidence of the persistence of the differences between school grades revealed by tests throughout the first four years of industrial experience than we did in the case of the physical tests.

The corresponding medians for girls in physical tests are presented in Table 556. In height and weight there is no consistent relationship with school grade at either fourteen or eighteen years. At fourteen, the eighth-grade girls are taller but less heavy than the girls of the other grades, while at eighteen they are shorter and heavier than any other group. In vital capacity there is no consistent relation to school grade at fourteen, but at eighteen there is a steady improvement except for the fact that fifth- and sixth-grade records are the same. In strength of the hand there is little variation from grade to grade at either age, and no consistent relationship to school grade. In steadiness there is no positive relationship to school grade at fourteen years, but it is present at eighteen years except for the eighth-grade record with the right hand. In rapidity the relationship to school grade is irregular at both years and about equally so. The eighth grade has the best record of any in all of the eight measures except the fourteen-year one for the left hand—60 seconds. The other grades shift their order in the various measures. In card-sorting there is a steady improvement from grade to grade at both ages, and in both measures of the test. At fourteen years the eighth-grade record in time is 4.6 seconds ahead of the fifth-grade record, and at eighteen years it is 2.7 seconds ahead. In index the eighth-grade record is 4.4 seconds ahead of the fifth-grade at fourteen years, and 2.4 seconds ahead at eighteen years. The diversity between the grades is thus less at eighteen than it was at fourteen. The reason is the more rapid improvement of the fifth-grade group during the four years.

Among girls, then, there is little positive relationship between school grade completed and records in physical tests, but there is more evidence of such a relationship at eighteen years than there had been at fourteen years.

The medians for girls in the four mental tests are given in Table 557. In cancellation (index), a general relationship to school grade is clear. The irregularity is that the sixth grade has a poorer record than the fifth at both age levels. In accuracy the two years cannot be compared because the median of all four grades at eighteen was 100 per cent. In memory a positive relationship with school grade appears which is consistent throughout both age levels and all four measures with one trifling exception at fourteen years, when the seventh-grade record for the eight-place series is slightly poorer than the sixth-grade. At eighteen years, then, the improvement from grade to grade is present without exception. In the two practice pages of the substitution test, there is a clear positive relationship to school grade except for the fact that the sixth grade tends to have a poorer record than the fifth, just as it did in the index of cancellation. The sixth-grade girls are obviously slower than the fifth-grade. Even this irregularity is not present in the record for page 2 at eighteen years. In the index of the memory page, the improvement from grade to grade is regular at both ages. In accuracy the records are all too near perfection to furnish a good basis of comparison. The fact that the accuracy of the eighteen-year record is slightly below that of fourteen is due to the greater amount of practice given at fourteen years. In opposites, in spite of the fact that the test is too easy to furnish a good basis of comparison, the positive relation to school grade is consistent at both years.

In mental tests of girls, then, the positive relation to school grade completed is fully as evident at eighteen years. after four years of industrial life, as it was at the close of school life.

The Relation between Average Percentile Ranks in Mental and Physical Tests and School Grade Completed

The previous section consisted of a study of the relation between school grade completed and test records at fourteen and at eighteen years, based upon medians only. A study which takes only medians into consideration may miss important factors. The present section, which is based upon average percentile ranks, presents comparisons at every ten-percentile level and gives the data not only for fourteen and eighteen years but for the intervening years as well. It is also more comprehensive in that it includes in the mentals series all the tests given at each age, and not merely those common to all ages.

The ten-percentile scales of physical tests for boys at each of the five years, and for each of the four grades, are given in Table 558. An inspection of the table shows that in each of the five annual tests there is a clear relationship between school grade completed on leaving school and percentile rank in physical tests. Without exception at any point in the table, the improvement of the record from grade to grade is clear during every one of the five years. The single combined record of physical tests shows a more marked relationship to school grade than did the study of individual tests.

It is not easy to determine from the table whether the differences from grade to grade are more or less distinct at eighteen than they were at fourteen. Since the progression from grade to grade is so uniform, it seemed fair to take the difference between the eighth-grade record and the fifth-grade record each year as an indication of whether the differences between grade groups were altering with time or remaining constant. Table 559 presents the differences. Those at eighteen are fully as great as those at fourteen. The scale of difference varies a little from year to year, but the table contains no suggestion of a tendency to change consistently with

TABLE 558

AVERAGE PERCENTILE RANKS BY GRADE

Physical Tests

Boys

Percentiles	14 yrs.				15 yrs.			
	Grade V	Grade VI	Grade VII	Grade VIII	Grade V	Grade VI	Grade VII	Grade VIII
10	19.7	22.4	26.2	27.3	21.9	20.3	24.8	30.9
20	26.1	28.1	31.6	35.5	26.6	29.1	31.7	37.0
30	30.9	34.5	37.4	40.8	31.7	33.6	37.3	41.3
40	35.7	38.0	41.4	45.9	35.7	38.5	41.9	44.9
50	38.7	41.5	45.8	50.3	40.4	43.1	45.8	48.4
60	43.1	45.7	49.9	53.8	44.4	46.9	49.3	52.0
70	47.2	49.7	54.8	57.6	49.1	50.2	54.3	56.5
80	51.9	55.3	59.8	63.0	53.1	53.6	58.0	62.6
90	59.3	61.5	64.3	72.9	59.0	60.5	66.3	67.9

Percentiles	16 yrs.				17 yrs.			
	Grade V	Grade VI	Grade VII	Grade VIII	Grade V	Grade VI	Grade VII	Grade VIII
10	21.3	23.3	26.4	27.4	24.9	22.8	31.5	35.5
20	26.2	31.5	35.7	33.5	30.9	31.9	36.7	42.5
30	32.0	36.1	39.6	40.7	35.4	36.5	41.0	45.5
40	36.5	40.1	42.8	43.7	39.8	39.7	45.0	50.3
50	40.7	43.3	46.2	50.7	43.6	44.5	48.4	52.3
60	44.2	46.8	50.2	53.6	47.5	48.7	53.4	54.3
70	48.2	51.0	57.2	59.0	53.8	53.0	58.4	59.3
80	53.4	56.8	64.5	63.5	57.2	58.2	63.2	70.5
90	59.5	68.4	71.1	72.7	62.1	68.4	75.0	74.2

Percentiles	18 yrs.			
	Grade V	Grade VI	Grade VII	Grade VIII
10 . .	26.4	29.4	33.0	40.7
20 . .	35.5	35.5	39.7	45.4
30 . .	40.5	42.3	43.8	50.1
40 . .	43.5	47.3	48.7	54.8
50 . .	46.7	50.4	53.4	57.5
60 . .	50.2	53.6	61.1	60.2
70 . .	53.7	59.4	65.1	63.5
80 . .	59.4	64.2	68.6	69.4
90 . .	65.6	69.9	74.0	76.7

time. The differences in physical ability demonstrated at fourteen, when the boys were just leaving school, are just as distinct and of the same general order at eighteen, after four years of industrial experience.

The average percentile ranks in mental tests for each of the four school grades and at each age level are given in Table 560. The table shows a greater and more perfect raising of the level of the scale from grade to grade than did the average percentile rank in physical tests. To discover whether the differences between grades are greater or less at eighteen than they were at fourteen, a table of differences between the fifth-grade and the eighth-grade scales has been made out (Table 561). The differences are large—from fifteen to thirty points on the scale. They are somewhat greater at seventeen and eighteen than they were at fourteen and fifteen. The table shows clearly that differences in mental ability as demonstrated by tests at fourteen years, when leaving school, are just as distinct, or perhaps more so, at eighteen years, after four years of industrial experience. Since both the tests used and the personnel of the grade groups changed slightly from year to year, small differences cannot be interpreted, but the trend of the table is undoubted. In so far as elimination affected the result, it would tend to decrease rather than to increase the difference between fifth- and eighth-grade records, since the fifth grade lost a larger proportion of its very inferior members than the eighth grade.

Another method of stating the difference between fifth and eighth grade in physical and in mental tests is to note the proportion of the fifth grade which equals or excels the average of the eighth, and the proportion of the eighth grade which falls at or below the median of the fifth. While these proportions differ somewhat from year to year, it remains true that from 25 to 35 per cent of the eighth-grade boys fall at or below the median of

TABLE 559

DIFFERENCES BETWEEN EIGHTH-GRADE AND FIFTH-GRADE SCALES OF AVERAGE PERCENTILE RANKS IN PHYSICAL TESTS

Boys

Grade VIII Less Grade V

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	7.6	9.0	6.1	10.6	14.3
20	9.4	11.3	7.3	11.6	9.9
30	9.9	9.6	8.7	10.1	9.6
40	10.2	9.2	7.2	10.5	11.3
50	11.6	8.0	10.0	8.7	10.8
60	10.7	7.6	9.4	6.8	10.0
70	10.4	7.4	10.8	5.5	9.8
80	11.1	9.5	10.1	13.3	10.0
90	13.6	8.9	13.2	12.1	11.1

TABLE 560

AVERAGE PERCENTILE RANKS BY GRADE

MENTAL TESTS

Boys

PERCENTILES	14 yrs.				15 yrs.			
	Grade V	Grade VI	Grade VII	Grade VIII	Grade V	Grade VI	Grade VII	Grade VIII
10	19.5	26.2	29.1	34.6	21.3	27.4	32.0	40.5
20	24.1	33.1	38.1	47.0	27.5	33.6	36.0	46.4
30	28.5	37.8	42.8	51.0	31.3	39.1	38.6	49.1
40	31.9	42.0	47.7	54.7	33.4	42.8	41.9	52.2
50	34.9	46.7	52.5	60.4	35.7	45.9	46.1	55.0
60	40.6	50.8	57.3	63.2	38.9	48.5	49.8	58.5
70	45.5	54.5	62.9	66.9	42.2	51.5	54.5	62.7
80	48.9	58.5	68.8	71.6	46.1	55.7	58.8	67.8
90	56.9	63.5	73.8	75.7	54.5	59.1	64.2	73.4

PERCENTILES	16 yrs.				17 yrs.			
	Grade V	Grade VI	Grade VII	Grade VIII	Grade V	Grade VI	Grade VII	Grade VIII
10	20.4	26.8	33.2	34.0	23.5	32.0	35.7	40.3
20	24.5	30.9	37.5	44.0	26.7	35.9	40.9	46.8
30	28.7	34.7	40.7	49.8	29.3	38.5	44.2	52.2
40	32.4	38.3	43.1	53.9	31.5	41.1	47.3	56.5
50	35.8	42.3	45.6	57.5	33.4	43.6	50.5	60.5
60	38.7	48.3	48.6	61.0	35.6	46.6	54.1	63.1
70	43.0	50.8	53.2	64.5	39.3	50.0	57.5	66.8
80	48.1	53.4	58.8	69.0	43.3	53.2	61.3	74.4
90	53.1	57.7	64.1	73.7	49.3	59.0	67.5	78.5

PERCENTILES	18 yrs.			
	Grade V	Grade VI	Grade VII	Grade VIII
10	24.9	35.9	37.0	42.5
20	28.2	41.0	43.4	54.0
30	34.7	44.4	47.6	59.0
40	38.9	47.9	50.9	65.0
50	42.2	51.4	55.0	68.2
60	45.2	55.1	58.2	70.9
70	49.3	58.3	61.4	73.2
80	55.2	62.6	64.9	75.9
90	62.6	71.0	73.2	80.0

TABLE 561

DIFFERENCES BETWEEN EIGHTH-GRADE AND FIFTH-GRADE SCALES OF AVERAGE PERCENTILE RANKS IN MENTAL TESTS

Boys

Grade VIII Less Grade V

Percentiles	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	15.1	19.2	13.6	16.8	17.6
20	22.9	18.9	19.5	20.1	25.8
30	22.5	17.8	21.1	22.9	24.3
40	22.8	18.8	21.5	25.0	26.1
50	25.5	19.3	21.7	27.1	26.0
60	22.6	19.6	22.3	27.5	25.7
70	21.4	20.5	21.5	27.5	23.9
80	22.7	21.7	20.9	31.1	20.7
90	18.8	18.9	20.6	29.2	17.4

the fifth in physical tests each year, while from 25 to 30 per cent of the fifth-grade boys equal or excel the median of the eighth. In mental tests 10 per cent or less of the eighth-grade boys fall at or below the median of the fifth grade, while less than 10 per cent of the fifth grade equal or excel the median of the eighth grade in any year.

In a previous study of the boys of our working series (2, p. 67), Edward S. Jones found the correlations between average mental test records and school grade completed for the group of working boys whose records were continuous throughout the first four years. In this group, elimination played no part. The correlations were as follows:

	14 yrs.	15 yrs.	16 yrs.	17 yrs.	Total Average
School Grade . .	.51	.45	.51	.66	.63

The fact that the degree of correlation with school grade tends to maintain its level, and even to be greater after three years in industry than it was at the start, is in accordance with the data just presented.

The ten-percentile scales of average percentile rank in physical tests for girls, for each grade and each year separately, are given in Table 562. An inspection of the table shows a general improvement in the level of the scale from grade to grade each year, but there are many irregularities and inconsistencies—cases in which some of the percentile values of the fifth grade are above those of the sixth, or some of the sixth-grade values above those of the seventh-grade. These irregularities are more frequent at fourteen than at eighteen. The table of differences between eighth-grade and fifth-grade scales at each age level (Table 563) shows a greater difference at

TABLE 562

AVERAGE PERCENTILE RANKS BY GRADE

Physical Tests

Girls

Percentiles	14 yrs.				15 yrs.			
	Grade V	Grade VI	Grade VII	Grade VIII	Grade V	Grade VI	Grade VII	Grade VIII
10	23.2	25.6	25.6	31.9	23.9	23.5	25.4	32.0
20	30.4	30.6	31.3	38.0	31.1	29.7	29.7	41.6
30	33.5	34.5	34.0	42.8	34.8	35.6	32.7	44.9
40	38.0	39.0	37.0	47.5	37.8	39.6	37.3	49.4
50	42.8	42.4	42.2	51.4	40.8	42.5	45.2	53.3
60	47.5	45.5	47.8	54.8	43.7	45.4	48.8	57.2
70	51.7	49.5	52.9	58.1	46.8	49.4	54.9	60.7
80	55.2	53.3	59.2	62.8	55.2	53.7	60.6	63.2
90	65.1	61.0	63.8	74.8	61.4	58.4	68.6	73.5

Percentiles	16 yrs.				17 yrs.			
	Grade V	Grade VI	Grade VII	Grade VIII	Grade V	Grade VI	Grade VII	Grade VIII
10	25.0	25.7	24.3	38.5	23.2	27.5	26.6	35.5
20	31.5	31.2	29.5	44.8	30.0	35.0	34.8	44.0
30	34.5	34.6	38.2	48.3	35.7	40.3	42.2	47.7
40	38.2	39.5	44.0	51.5	40.7	44.5	48.2	51.5
50	41.5	45.0	49.2	54.5	43.5	47.3	50.9	58.8
60	44.5	50.4	54.7	58.2	47.5	50.0	58.0	61.7
70	48.6	53.9	58.2	62.0	51.8	54.7	63.1	63.9
80	53.4	58.8	64.2	66.5	55.0	61.3	68.3	68.7
90	61.0	65.0	72.6	74.4	66.3	70.9	75.1	77.2

Percentiles	18 yrs.			
	Grade V	Grade VI	Grade VII	Grade VIII
10	22.2	33.9	30.4	39.0
20	29.4	40.5	37.3	45.3
30	34.9	44.1	42.7	49.8
40	40.5	47.0	46.9	54.3
50	46.9	49.7	51.1	60.0
60	50.8	53.2	54.7	63.6
70	54.1	57.7	60.8	66.6
80	62.4	62.4	66.9	69.2
90	67.2	67.9	76.0	75.7

TABLE 563

DIFFERENCES BETWEEN EIGHTH-GRADE AND FIFTH-GRADE SCALES OF AVERAGE PERCENTILE RANKS IN PHYSICAL TESTS

Girls

GRADE VIII LESS GRADE V

PERCENTILES	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	8.7	8.1	13.5	12.3	16.8
20	7.6	10.5	13.3	14.0	15.9
30	9.3	10.1	13.8	12.0	14.9
40	9.5	11.6	13.3	10.8	13.8
50	8.6	12.5	13.0	15.3	13.1
60	7.3	13.5	13.7	14.2	12.8
70	6.4	13.9	13.4	12.1	12.5
80	7.6	8.0	13.1	13.7	6.8
90	9.7	12.1	13.4	10.9	8.5

eighteen than at fourteen. The grade differences stated in this form are far more striking than they are when based upon a direct comparison of the medians of the separate tests. In spite of the fact that the medians of the separate tests differ but little from one another, it must be true that the lower grades contain more individuals with consistently low records and the upper grades more individuals with consistently high ones. These differences appear in an average percentile rank but not in the medians of separate tests. There is, then, a definite and positive relation between ability in physical tests and school grade completed among girls also. Rather than tending to disappear with industrial experience, it is greater at eighteen, after four years of wage-earning, than it was at fourteen on just leaving school.

The scales of average percentile rank of girls in mental tests for each school grade and at each age level are given in Table 564. An inspection of the table shows a far more perfect and consistent relation to school grade than in the case of physical tests. Each year it is true that the record improves from grade to grade without exception. Once more the difference between fifth-grade and eighth-grade scales each year (Table 565) are presented to determine the permanence of the grade differences. The table shows the same slight irregularities from year to year as the other similar tables, but no tendency for the difference to become consistently greater or less in successive years. The difference is fully as distinct at eighteen as it was at fourteen.

A comparison of the fifth-grade and eighth-grade records on the basis of the location of the medians of each grade with reference to the other shows a relationship similar to that of the boys. In physical tests, from 15 to 30 per cent of the eighth grade falls at or below the median of the fifth,

TABLE 564

AVERAGE PERCENTILE RANKS BY GRADE

MENTAL TESTS

Girls

PERCENTILES	14 yrs.				15 yrs.			
	Grade V	Grade VI	Grade VII	Grade VIII	Grade V	Grade VI	Grade VII	Grade VIII
10	20.7	22.5	35.4	40.4	21.7	23.3	30.9	39.8
20	26.0	28.1	39.9	42.9	26.1	29.0	35.9	47.0
30	31.1	35.6	43.8	52.0	29.4	32.7	40.8	50.4
40	33.1	40.6	47.8	55.5	36.0	37.5	44.2	53.5
50	35.2	44.6	51.9	58.9	39.0	41.5	47.7	58.1
60	38.1	48.2	56.5	61.9	41.8	43.8	51.3	61.6
70	41.1	52.2	61.8	64.8	44.5	46.8	55.0	63.8
80	49.0	58.0	66.1	69.7	50.0	52.5	58.6	66.8
90	53.4	66.9	72.7	75.8	60.8	58.9	66.3	72.8

PERCENTILES	16 yrs.				17 yrs.			
	Grade V	Grade VI	Grade VII	Grade VIII	Grade V	Grade VI	Grade VII	Grade VIII
10	20.1	23.0	31.5	38.0	20.4	20.7	31.0	40.4
20	23.5	31.3	37.1	46.8	23.6	27.2	37.2	45.6
30	26.7	34.2	40.9	52.2	26.6	31.4	41.7	49.9
40	29.7	38.6	44.0	56.2	29.4	34.9	45.7	52.7
50	33.1	41.9	47.3	58.7	33.5	38.4	48.4	55.4
60	37.6	44.6	51.3	61.1	36.9	42.1	51.3	59.0
70	42.3	47.6	56.8	63.6	39.7	46.0	54.6	63.1
80	46.5	50.9	62.0	67.2	45.0	49.8	61.1	67.4
90	53.2	55.9	69.4	74.4	53.8	55.4	66.0	72.2

PERCENTILES	18 yrs.			
	Grade V	Grade VI	Grade VII	Grade VIII
10	23.5	28.1	36.0	42.5
20	27.2	32.2	42.2	48.4
30	30.4	35.9	46.1	53.8
40	33.5	40.4	48.6	58.8
50	37.5	44.3	51.4	62.2
60	41.8	47.8	54.5	65.0
70	45.5	51.8	60.0	66.7
80	48.7	54.4	65.0	68.4
90	55.5	59.3	70.0	70.0

TABLE 565

DIFFERENCES BETWEEN EIGHTH-GRADE AND FIFTH-GRADE SCALES OF AVERAGE PERCENTILE RANKS IN MENTAL TESTS

Girls

GRADE VIII LESS GRADE V

PERCENTILES	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.
10	19.7	18.1	17.9	20.0	19.0
20	16.9	20.9	23.3	22.0	21.2
30	20.9	21.0	25.5	23.3	23.4
40	22.4	17.5	26.5	23.3	25.2
50	23.7	19.1	25.6	21.9	24.7
60	23.8	19.8	23.5	22.1	23.2
70	23.7	19.3	21.3	23.4	21.2
80	20.7	16.8	20.7	22.4	19.7
90	22.4	12.0	21.2	18.4	14.5

while from 20 to 30 per cent of the fifth grade falls at or above the median of the eighth. In mental tests, 10 per cent or less of the eighth grade falls at or below the median of the fifth in various years, while 10 per cent or less of the fifth grade falls at or above the median of the eighth.

SUMMARY OF SECTION I

I. (1) In a study based on the medians of test records, boys and girls both show as much relationship between mental and physical tests and school grade completed at eighteen years, after four years of industrial experience, as they did at fourteen years, when just leaving school.

(2) In a study based on average percentile rank in tests, the relationship to school grade completed was as close at eighteen as it had been at fourteen in the physical tests, and somewhat closer in the mental tests.

(3) A correlation of school grade with mental-test average for the group of boys whose records were constant from year to year showed a higher correlation at seventeen, after three years of industrial life, than had existed at fourteen.

II. There is a much more marked and consistent positive relationship between mental tests and school grade completed than between physical tests and school grade completed—this is true whether the basis of study is the medians of separate tests or average percentile rank.

SECTION II: A STUDY OF SUPERIOR CHILDREN WHO HAD COMPLETED ONLY THE FIFTH GRADE AND OF INFERIOR CHILDREN WHO HAD COMPLETED THE EIGHTH GRADE AT FOURTEEN YEARS

In studying the school grade completed by various children at fourteen years, two groups proved to be of special interest. Among the children who had completed only the fifth grade at fourteen were some whose records in mental tests were as good as or better than those of the eighth-grade children. On the other hand, among those who had completed the eighth grade at fourteen years were some whose records were as poor as or worse than the median of the fifth grade. We finally selected for study all of the children of the fifth grade whose mental average for at least two years out of the five had been equal to or above the median of the eighth. There were in this group seven boys and six girls. From the eighth grade we selected all those whose mental average for at least two of the five years had been as poor as or below the median of the fifth grade. There were five boys and three girls in this group. Though the groups were small, the method of selection makes them interesting and significant.

Our next step was to sum up all the information about school records, health, character and personality, home conditions, and industrial careers of these two groups of children.

Comparison of the Two Groups of Exceptional Fifth- and Eighth-Grade Boys

SCHOOL LIFE

Among the seven boys of the fifth grade who had high records, three had attended public schools only, three had attended both public and parochial schools, and one had attended parochial schools only. Their academic school records were rated medium in three cases, good in three cases, and very good in one case. Conduct was rated medium in three cases and good in four cases. None of these children had a record of delinquency. Five of the seven had attended as many as three different schools up to the age of fourteen, one had attended two different schools, and only one had been in but one school. Three of the seven reported serious loss of time through illness. In reporting reasons for leaving school, all seven of these children said that their parents needed help and wished them to leave. Only two of them stated definitely that they would have preferred to remain in school. Of the seven, four had done no work outside of school hours, while three of them had worked outside of school hours. Of the five eighth-grade boys with poor mental records, one had attended a city public school, one had attended a country public school, and three had attended parochial schools. The records of academic work were good or very good for all of this group. Of these five boys, three had attended but one school and the other two but two schools. Of the children who had attended two schools, residence in one of the two had been for a very brief period, leaving the greater part of their school life in one school. No one of these children reported a loss of time from school for any reason. Three of these boys reported that they liked school but that the family needed their help. One of them was assisting his parents to send an older brother through a theological school. Two of them felt that they were growing too old for school and wished to go to work. No one of the five had done any work outside of school hours during his school life.

So far as school career is concerned, the outstanding differences between these two groups are as follows: The fourteen-year-old boys of poor mentality who had completed the eighth grade had stayed for the most part in one school throughout their careers. Only two of them had been in more than one school and in one of the two for only a short time. Moreover, the schools which they were attending were either parochial schools or country day schools. It is probable that in neither of these types of school are the academic standards as rigid as those of the regular public school. The fourteen-year-old boys who had completed only the fifth grade, in spite of a good mental rating, had been in as many as three different schools as a group. They had shifted back and forth from public to parochial schools and had remained several years in each type. One of these boys, who reports that two schools were attended, was for eight years in the school of the House of Refuge, a school which at that time was notoriously poor. The boys were sent an inadequate number of hours and had very inferior teachers. After eight years of residence in such a school this child could not be placed beyond the fifth grade of the public school. The only instance of a boy in this group who had attended but one school was a parochial school boy. Later records state that this boy had completed not the fifth but the seventh grade. Since after leaving school he completed the eighth grade in continuation school, we are inclined to think that the latter statement is true. Since all records are fallible, it is probable that his original record stating that he had completed only the fifth grade was an error and should have read seventh grade. It is also significant that three of the seven fifth-grade boys had worked outside of school hours while attending school, whereas none of the eighth-grade boys had.

HEALTH

Among the seven superior boys of the fifth grade, three have records of real difficulties in health. One of them had had typhoid and brain fever, which meant a loss of time and a reduction of vigor. One of them had exceedingly bad tonsils, adenoids, and teeth, was undersized, and after leaving school was reported as probably dissipated. A third one had enlarged tonsils and glands, and was deaf at times. A fourth one, while his general health was reported as good, had lost time from illness when he was in the first grade. Of the seven boys, four had normal vision and three had vision of one-half or two-thirds. None of them had difficulty with hearing which constituted a serious handicap, though one was deaf at times and one was permanently deaf in one ear. Of the five eighth-grade boys, three had perfectly normal vision; one had two-thirds vision; and one, decidedly defective vision. All of them were normal in hearing. All of them were reported as in good general health, though one child belonged in a family suffering from tuberculosis. This child had lived in an orphan asylum up to within a year of the time of going to work. Two of his brothers died of tuberculosis about two years after he returned to the family, and he later developed symptoms of it himself. During his school period, however, there is no indication of trouble of this type. Our conclusion is that while several of the fifth-grade boys, probably three of them, lost time through illness, none of the eighth-grade boys did. Handicaps of vision and hearing were somewhat more frequent among the fifth grade than among the eighth-grade group.

HOME CONDITIONS

Of the seven superior fifth-grade boys, both parents were American-born in all but one case. That one case is the doubtful one which probably belongs in the seventh grade. One of this boy's parents was German-born. English was the language of the home for all of them. Five of the seven boys had mothers who worked outside of the home. One of those who had not was our doubtful case. All seven of the boys had mothers who were living, while four of them had fathers who were dead and only three fathers who were living. There were no step-parents in any of the families. The corresponding facts about the inferior eighth-grade boys were as follows. Only three of them belonged in families in which both parents were American-born. In the other two both were German-born. English was the language of the home in three cases, and English and German in the other two. In only one of these families was the mother employed outside of the home. All five of these boys had mothers who were living, but two of them had fathers who were dead. There were no step-parents.

So far as these general conditions are concerned, the significant facts seem to be that among the fifth-grade boys there were a larger number of cases in which the father was dead and the mother compelled to work outside of the home. It is interesting to note that while all of the fifth-grade group belonged in purely American families, two of the eighth-grade groups belonged in families in which both parents had been born in Germany. Accordingly, we cannot blame our foreign population for any of the retardation of these superior fifth-grade children. Neither can any of the retardation be attributed to the use of a foreign language in the home, since two of the eighth-grade boys had succeeded in spite of this handicap. Among the seven superior fifth-grade boys not one family lived in a home owned by the family, while of the five eighth-grade boys two certainly, and a third one probably, lived in a house owned by themselves. The fact that the eighth-grade children had attended the same school and lived in the same neighborhood for eight consecutive years is doubtless related to the fact that these families owned their own homes, while the shifting schools of the other group are doubtless the result of the fact that these families lived in few rooms and moved rather frequently. Among the seven boys of the fifth-grade group only three—and one of those the doubtful case—had homes in which both father and mother were living and the family constitution normal. In the others the father was dead or he was divorced from the mother. Of the five eighth-grade boys, three had normal homes with both parents living, while two belonged in families in which the father was dead. One of these boys had been in a Catholic orphan asylum for seven years, which constituted most of the time of his school career. Among the seven boys of the superior fifth-grade group, there are three cases in which the family atmosphere is reported as definitely unfavorable. The mother was indifferent and dispirited and the atmosphere unhappy. In two cases very little was known about the real conditions of home life. In one instance the child had had almost no home life since he had been brought up in the House of Refuge until almost time to go to work. Since his mother did washing and house-cleaning and died within a year or two of the time the boy left school, the probabilities are that the home atmosphere was poor. In the doubtful case, our information is meager but the probabilities are that the home atmosphere was good. Among the five boys who had completed the eighth grade, in every instance the home atmosphere is reported as cheerful and stimulating. The mothers were interested in the children and able to maintain a cheerful and pleasant spirit in the home.

PERSONALITY

The varieties of personality are so great that it is difficult, if not impossible, to make group summaries based upon personal traits. However, in looking over the notes on personality of the two groups we are considering, a few points of interest stood out. None of either group was set down as a probable leader among boys, except our one doubtful case. In the fifth-grade group at least five of the seven were obviously lacking in the quality of leadership. The comments were "no pep," "not a mixer," "has no initiative," "not a leader." With regard to the eighth-grade boys but one such comment was found, though there were also none of the reverse expressions. None of the fifth-grade boys produced the impression of being superior in spite of their relatively good mental rating. Two of the eighth-grade boys were commented upon as producing the impression of being superior in spite of their poor rating. One of them was a boy "who could be trusted anywhere." He was also tall, handsome, a good talker and interesting, though slow.

INDUSTRIAL LIFE

The other point of contrast has to do with the purposefulness and stability of their lives. While the fifth-grade boys shifted about from one job to another and from one industry to another, the eighth-grade group tended to remain in one position until some well-considered reason brought about a change. The facts with regard to the number of positions held, and the number of industries entered, are as follows: Of the seven superior fifth-grade boys, one had held four positions, three had held five positions, one had held eight positions, one had held eleven, and one had held twelve positions. Most of these were for short periods. The longest time recorded for any one of these boys was three years in one job. There was one other position held for two years and several held for a year and a half. The majority, however, were for periods of less than a year. Among our inferior eighth-grade boys two of the five had held but two positions, one of them had held three positions, one had held four, and one, seven positions. Every one of these boys arrived at stable work which was held either four or five years in each instance. The other positions recorded are only brief trials of a few months each.

When summed up in terms, not of the number of positions held, but of the number of different kinds of industry entered, the contrast is equally great. Among the superior fifth-grade boys there were three who worked in three different industries, one who worked in four industries, one who worked in six industries, one who worked in ten industries, and one who worked in twelve industries. Among our eighth-grade boys, one had worked in only one industry, one in two industries, one in three industries, one in four industries, and one in five industries.

Comparison of the Two Groups of Exceptional Fifth- and Eighth-Grade Girls

The corresponding groups of girls were smaller. There were six fifth-grade girls who ranked at or above the average of the eighth grade in at least two of their annual tests, and there were three eighth-grade girls who ranked at or below the average of the fifth grade in at least two of their tests.

SCHOOL LIFE

Among the six fifth-grade girls, two had attended public schools only, while four had attended both public and parochial schools. One of these children had been in but two schools—one public and one parochial. Three of them had attended three different schools, one of them four different schools, and one of them six different schools, before the age of fourteen years. Four of the six reported prolonged absence due to illness, which probably meant the loss of a year's promotion. The academic records of five of these children were good and of the sixth one, medium. Four of them were reported as excellent in conduct and two as good. None of them had records of delinquency. Most of the superior fifth-grade girls belonged in families in which their help was needed. Only two of them, however, really liked school and would have preferred to stay if they could. The other four wanted to leave. Two of the six had worked outside of school hours helping to take care of children.

Of the three eighth-grade girls with poor records, one had attended but one school; one had attended three schools, one of them public and two parochial; and a third had attended three schools, all public. Two of the three had been attending parochial schools at the time of the completion of the eighth grade. The academic school record of all of these eighth-grade girls was good and the conduct good in the two cases for which we have any record at all. None of the eighth-grade children had been absent from school sufficiently to account for any loss of time. Of the three eighth-grade girls, one left school because she had completed the eighth grade of the parochial school which she attended and did not wish to continue. Her mother would not force school attendance. The other two left because of an economic necessity. Both reported that they would have preferred to stay in school. No one of the three had done any regular work outside of school hours.

The contrast between the two groups of girls so far as school career is concerned is similar to that between the two groups of boys. The girls who had completed only the fifth grade in spite of relatively good ability had shifted about from one school to another far more than the others and had lost more time through absence due to illness. They had also done more work outside of school hours. In the case of the girls, too, the school completed by the inferior eighth-grade girls in two instances was a parochial school where the standards of promotion were less rigid than those of the public school.

HEALTH

The health conditions of the six fifth-grade girls were as follows: One had good general health and no serious defects of vision and hearing; a slight degree of near-sightedness was the only departure from the normal. One had good general health and good vision and hearing, but had lost a year from school at one time because of an accident in which she had been badly scalded. A third had good general health and perfect hearing but very weak eyes. A fourth was deaf in one ear and had some trouble with her eyes. A fifth had normal vision but was deaf in one ear, and had had a long succession of serious illnesses including spinal meningitis, typhoid fever, smallpox, scarlet fever, and the infectious children's diseases. The sixth had normal vision and hearing and fairly good health, but was developing a marked goiter.

Of the three eighth-grade girls all had good general health and no defects of vision or hearing. As in the case of the boys, there is far more evidence of illness and physical handicap among the fifth-grade group than among the eighth-grade group.

HOME CONDITIONS

Of the six fifth-grade girls, three had parents both of whom were American-born. One had one American-born and one foreign-born parent; and two had foreign-born parents. The language of the home was English in five of the six cases, and English and German in the sixth one. In only two of the six homes were both parents living and present. In two cases the mother was dead, and in two cases the father had deserted the family years before. There were two step-mothers, one good and one bad. In three of the six cases the mother was employed outside of the home.

Of the three eighth-grade girls, two had parents both of whom were American-born, and one had parents both of whom were foreign-born. English was the language of the home in two instances, and English and German in the third. None of these mothers was employed regularly outside of the home, though one of them worked occasionally. The father and mother were both living in two cases, and the mother was living in the third case. There were no step-parents. The contrast between these groups is similar to that between the two groups of boys. In the fifth-grade group there were more cases of broken families and mothers employed outside of the home. It is also true, as in the case of the boys, that foreign-born parents were not a factor in the situation. There was the same proportion of foreign-born parents in both groups.

No one of the six families of superior fifth-grade girls owned their own home, while two of the families of the three eighth-grade girls did and the third family had lived in the same house for nineteen years. The mother felt so firmly established that it was difficult to persuade her to move even when it seemed desirable. This stability of residence again seems related to stability of school career. The home atmosphere in four of the homes of fifth-grade girls was distinctly poor. It is reported as cheerless, with no ideals, bitter and severe, and characterized by ignorance. In the fourth case, while no direct comment is made, the fact that the father was a saloon keeper and the mother died of tuberculosis during the child's school life is suggestive of what the atmosphere probably was. Two of these children had a good home atmosphere, but one of them was a family which was the victim of a great deal of illness. Of the three eighth-grade girls, two belonged in homes of distinctly superior atmosphere, good ideals, and high standards of living. The third was a home in which there was no father and the mother was working desperately as laundress and janitress in the face of illness and physical debility. She died about two years after this girl began to work. Her devotion to her children was heroic and perhaps compensated for what the home lacked otherwise. Of the six homes of the fifth-grade girls, only two were normal in constitution with the child's own mother and father present. One of these had suffered from excessive amounts of illness. The conditions of the other four were as follows: In Home 1, the father had deserted the mother, leaving her with five small children, including twin babies. The mother later developed tuberculosis. She was a bitter, severe, nagging woman. In Home 2, the father had also deserted, leaving the mother with five children. The mother had hated school herself and took no interest in it on behalf of her children. She did not care about their progress in school and was glad to have them at home. This mother also developed tuberculosis and died of it about four years after this child began to work. In Home 3, there were two families of children. Five of them belonged to the mother by a previous marriage, and three to the father by a previous marriage. There was constant friction and unhappiness, and the step-mother was unkind to the daughter who was our special interest. A year or two after going to work, this girl left home and went to live with an aunt. In Home 4, the mother had died of tuberculosis. The father was a saloon keeper. Luckily for the children, he remarried a few years before this girl went to work. The step-mother was a capable, energetic woman. Within a short time after this girl went to work, the step-mother got the father out of the saloon business and out on a farm on the outskirts of the city where they lived wholesomely and saved money. She took hold too late, however, to do much to benefit the school career of our girl. Moreover, she herself was ill with an "open sore on her leg"—a complaint from which the father had previously suffered, which made her comparatively helpless for some time. It was in part the step-mother's illness which made it necessary for our girl to leave school.

Two of the eighth-grade girls belonged in homes where both father and mother were living, the fathers supported the families, and the mothers were both intelligent and ambitious women who maintained good ideals and an intelligent atmosphere in the home. One of these girls left school because she herself insisted and her mother would not force her to remain. The other family felt that it could not afford to educate all of its daughters beyond the eighth grade, and therefore none of them continued beyond that point. They were, however, sent to business college at night. In the third home, the father had died of sunstroke when this girl was but four years old. The mother had struggled heroically to keep the children in school at least through the eighth grade. She was a laundress and janitress. However, her health was failing and it was imperative that she have help.

We find, then, that both home atmosphere and the social conditions of the home of the eighth-grade girls were very superior to those of the fifth-grade.

PERSONALITY

In the comments on personality, amid the variety of traits commented upon, the same type of contrast between the two groups of girls appears as in the case of the boys. The superior fifth-grade girls in three cases of the five are reported as "very docile," "no spirit," "too docile," and "lacking in pep." One is reported as "pleasant and friendly," with no comment on qualities of leadership. The fifth one is said to be ambitious and energetic, but without definite plans. Of the three inferior eighth-grade girls, one is reported as a probable social leader. She was very attractive and interested in her pleasures, though she had no wide or general interests. The other two were both said to be "good-natured" and "willing." One, in addition, was hard-working and reliable. While neither set was conspicuous for qualities of leadership, the superior fifth-grade girls were conspicuously lacking in leadership and initiative.

INDUSTRIAL LIFE

In industrial life, too, the two groups of girls showed the same difference in steadiness and stability that the boys displayed. Of the six superior fifth-grade girls, one was of the stable type and held but one position during the first five years in industry. The other five held, respectively, three, five, six, seven, and ten positions. The majority of these were short-time jobs of less than a year, though two girls held one position for as much as three years. These girls, aside from the one stable one, worked in three, four, and five different industries. Of the three inferior eighth-grade girls, one held two positions, one three, and one four positions. Each of them held the same position for from two and one-half to three and one-half years. They worked respectively in one, two, and three industries. The greater industrial stability of the inferior eighth-grade girls is clear.

SUMMARY OF SECTION II

In attempting to account for the fact that some superior children complete only the fifth grade at fourteen years while some inferior children complete the eighth grade at the same age, no one or two factors can be held responsible, but differences between these two groups in school career, in health, in home conditions, in personality, and in subsequent industrial careers—differences which prove to be the same for girls and for boys—are discovered when the data of the two groups are compared.

I. The superior fifth-grade children showed conditions which were inferior in the following respects:

(1) The superior fifth-grade children had been shifted from school to school more than the inferior eighth-grade groups. They had also been subjected to more rigorous academic standards, since more of them had their final school rating given them by a city public school and fewer of them by country or parochial schools. The superior fifth-grade children had had more wage-earning employment outside of school hours than the inferior eighth-grade group.

(2) The records for health show that the superior fifth-grade children displayed more physical handicaps than the inferior eighth-grade group; they had lost more time from school because of illness and had a greater number of defects of vision and hearing.

(3) The superior fifth-grade group had homes which, in several respects, were inferior to those of the inferior eighth-grade children—fewer of their families owned their own homes and had a stable and established home life. More of them moved about from one set of rented rooms to another. More of the superior fifth-grade children belonged in homes in which the father was dead or had deserted the family than in the case of the inferior eighth-grade children. The result was that the mother worked outside of the home in the case of the fifth-grade children. Frequently a depressed and dispirited home atmosphere was created by an unhappy and overworked mother. The eighth-grade group, with but one exception, had a home atmosphere which was happier and more stimulating and wholesome than that of the fifth-grade children.

(4) In personality traits, the chief difference is that the superior fifth-grade children were found to be lacking, to a marked degree, in initiative, pep, or qualities of leadership. They were a docile and dispirited lot. The eighth-grade children, while not leaders, were not noted as conspicuously lacking in aggressive qualities.

(5) In their first years in industry, the superior fifth-grade children proved to be drifters who tried many things and stuck to none. The inferior eighth-grade group did far less shifting and settled down rapidly to years of steady employment.

II. Interpretation.

In no one case are all of these factors operative; each case displays its own complex pattern, and in every case more than one of these sets of conditions are fulfilled. It is only where groups are compared that the constancy of given conditions appear. When one tries to determine whether some of these factors are of a more fundamental nature than others and can be taken as conditioning the others, one is on debatable ground, in the judgment of the present observer. However, the status of the home and the home atmosphere seem to be, in most instances, the central factors. If the constitution of the family is normal, with the father at work and a reasonably harmonious relation existing between the parents, then an established residence in one district and the owning of property are much more likely to occur. The result is a school career which is carried out continuously in one school, and a child who is not likely to be burdened with work outside of school hours or distracted by home worries. A background of stability in family relationship and cheer at home tends to promote a frame of mind in which a child can attend to his school work and can feel on a level with his fellows. On the other hand, a home where the mother is overburdened with the necessity for supporting the children and often unhappy in her personal relationships makes for frequent shifts of residence, a broken school career, work outside of school hours for the child, and a degree of worry about home affairs which is not conducive to good school work. In addition, a feeling of inferiority and hopelessness is apt to be induced in the child, which takes the zest out of effort of any sort and may produce the effect of extreme docility and lack of spirit noticeable in our fifth-grade group. While certain aspects of health, such as frequency of infectious disease or the normality of sense organs, are largely independent of these home conditions, nevertheless, there can be no doubt that a stable, happy home atmosphere is, on the whole, conducive to good health, while instability and unhappiness are detrimental to general health. It seems probable that the striking difference in industrial career between our two groups is the outcome of differences in home and school conditions. The children that had the stable happy home background with an uninterrupted school career, and a moderate degree of self confidence, are those who rapidly reached an adjustment in industry; while those with the broken homes, irregular school career, and dispirited type of personality are those that, in spite of their superior mental ability, drifted about from one thing to another and failed to reach an adjustment.

It is a striking fact that the differences of home background, in these extreme cases, can not only counteract differences in mental ability, but can give to inferior children an advantage of three years in educational progress by the age of fourteen years.

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CHAPTER IX

THE RELATION OF MENTAL RATINGS TO PHYSICAL RATINGS

Various factors bearing upon the problem of the relation between rating in mental tests and that in physical tests have been brought out in previous chapters. It seemed worth while to sum these up and to add a few data bearing on the problem which are not elsewhere recorded.

The physical ratings used in the present study are derived from a series of tests in which some element of skill was involved. In addition there were mere measures of size—those of height and weight. Some of the tests of physical skill are obviously related to size—those of vital capacity and strength of the hand. Others—tests of speed and steadiness—have no such necessary relationship. To give a more accurate idea of the part played by mere size in our measure of physical skill, a correlation between height and average percentile rank in physical tests was worked out and is given in Table 566.

Apparently mere size is a more important factor in physical skill during the years of rapid adolescent growth than it is when adult size has been

TABLE 566

CORRELATION OF HEIGHT WITH AVERAGE PERCENTILE RANK IN PHYSICAL TESTS

Working Children (M)

	Boys	Girls
Year 14	.30	.31
Year 15	.44	.23
Year 16	.35	.24
Year 17	.19	.13
Year 18	.12	.14

TABLE 567

CORRELATION OF HEIGHT WITH AVERAGE PERCENTILE RANK IN MENTAL TESTS

Working Children (M)

	Boys	Girls
Year 14	.11	.08
Year 15	.12	.09
Year 16	.08	.06
Year 17	.06	.05
Year 18	.05	−.01

reached. For years seventeen and eighteen the correlation is very small, between .10 and .20 in every case.

The correlation between height and average percentile rank in mental tests is shown in Table 567.

In this case the correlation is very small, but is positive. It is, as one would expect, a much smaller correlation than that between size and skill in physical tests. In no case is the value higher than .12. It is interesting to note the same tendency for a higher correlation between size and mental skill during the years of rapid adolescent growth that we found between size and physical skill. It is doubtless related to the fact previously noted—that children who are superior mentally tend to reach their adult size earlier than the inferior children.

The correlation between rank in mental tests and rank in physical tests (Table 568) proved to be a more constant and apparently a more significant relationship than that between size and either type of test.

TABLE 568

CORRELATION OF AVERAGE PERCENTILE RANK IN MENTAL TESTS WITH AVERAGE PERCENTILE RANK IN PHYSICAL TESTS

Working Children (M)

	Boys	Girls
Year 14	.33	.25
Year 15	.33	.27
Year 16	.37	.35
Year 17	.30	.38
Year 18	.32	.41
Average of 3 or more annual tests	.44	.40

Since we had for the entire working series a measure in which the average percentile ranks for all of the annual tests were combined in one measure—an average of the percentile ranks for three or more years—it was possible to obtain a further correlation of mental and physical test records based upon the average for the series. No child for whom less than three annual tests were available was included in taking this final average. The correlation of mental test records for the entire series with physical test records was .44 for boys and .40 for girls. This correlation is obviously the one based upon most adequate data.

Why the correlation between mental and physical tests should increase steadily from fourteen to eighteen years in the case of girls, whereas it remains approximately constant for boys, we are at a loss to understand.

The tables so far presented are based upon records of working children only. For the school series, correlations for the separate years were figured, but an average of the percentile ranks of the several annual tests was not obtained. In interpreting correlations of the school series, it must be borne in mind that the individuals in the series changed far more than in the case of the working group, both because of the rapid elimination from school and because of the introduction of new individuals at sixteen. By the fifth year, the series included less than a hundred individuals of each sex (see Chapter II).

TABLE 569

CORRELATION OF AVERAGE PERCENTILE RANK IN MENTAL TESTS WITH AVERAGE PERCENTILE RANK IN PHYSICAL TESTS

School Children (X)

	Boys	Girls
Year 14	.30	.31
Year 15	.40	.45
Year 16	.22	.40
Year 17	.19	.31
Year 18	−.006	.05

Our conclusions can be summed up as follows: Among growing adolescents there is a positive correlation between mere height and physical skill represented by coefficients in the general range of .25 to .40, and a positive correlation of mere height with tests of mental ability represented by coefficients in the general range of .06 to .12. By the time an adult status is reached there is still a small positive correlation of mere height with physical skill, but practically none between mere height and mental ability. There is a positive correlation between skill in mental tests and skill in physical tests represented by a correlation of about .40.

Another method of comparing mental ratings with physical ratings is to note the relation between working children and school children in the two series—mental and physical. The percentage of working children that equalled or excelled the median of the school children in terms of average percentile rank in physical tests is given in Table 570.

The comparison in terms of average percentile rank in mental tests is given in Table 571.

These tables bring out strikingly several facts. In the first place, school children are more superior to working children when measured in terms of mental tests than they are when measured in terms of physical tests, except at fourteen years, where the reverse holds true to a slight extent. In the second place, while working and school children tend to approach one another from year to year in physical measures between the ages of fourteen and eighteen, they tend to recede from one another in terms of mental measures.

TABLE 570

AVERAGE PERCENTILE RANK: PHYSICAL TESTS

Boys

At 14 years, 17 per cent of M equalled or excelled the median X
At 15 years, 12 per cent of M equalled or excelled the median X
At 16 years, 18 per cent of M equalled or excelled the median X
At 17 years, 22 per cent of M equalled or excelled the median X
At 18 years, 26 per cent of M equalled or excelled the median X

Girls

At 14 years, 19 per cent of M equalled or excelled the median X
At 15 years, 20 per cent of M equalled or excelled the median X
At 16 years, 25 per cent of M equalled or excelled the median X
At 17 years, 31 per cent of M equalled or excelled the median X
At 18 years, 38 per cent of M equalled or excelled the median X

TABLE 571

AVERAGE PERCENTILE RANK: MENTAL TESTS

Boys

At 14 years, 25 per cent of M equalled or excelled the median X
At 15 years, 13 per cent of M equalled or excelled the median X
At 16 years, 13 per cent of M equalled or excelled the median X
At 17 years, 9 per cent of M equalled or excelled the median X
At 18 years, 10 per cent of M equalled or excelled the median X

Girls

At 14 years, 26 per cent of M equalled or excelled the median X
At 15 years, 18 per cent of M equalled or excelled the median X
At 16 years, 17 per cent of M equalled or excelled the median X
At 17 years, 9 per cent of M equalled or excelled the median X
At 18 years, 9 per cent of M equalled or excelled the median X

In trying to find an interpretation of these facts, it is necessary to bear in mind that not all of the physical tests displayed the same tendency from year to year. In other words, in the approach of working and school children to one another some tests played a large positive rôle, and others a small negative rôle. Steadiness, in which school children at fourteen and fifteen were very superior, shifted so much that at seventeen and eighteen the working children were very superior. This one test must, therefore, have played a large part in the approach of the two series to one another. In the two tests of rapidity—card-sorting and tapping—working children gained on school children, but did not equal them even at eighteen years. In vital capacity and strength the school children increased their lead on working children from fourteen to eighteen (see Chapter V).

In interpreting a series of facts so complex as this, one is on uncertain ground. Granting the uncertainty, the most probable guess is that changes of this type in which two comparable groups, starting from a known point of proficiency, shift their relationship to one another in allied tests in such different ways, are being brought about by experience and factors of environment rather than by innate tendencies. It is interesting to speculate as to why industrial life may have developed steadiness of muscular control in young people to a much greater degree than school life, though few of the occupations in which young people are employed demand a high degree of steadiness. We know little about what conditions steadiness of muscular control. One is apt to think of it as a kind of negative quality related to placidity and lack of nervous excitation. Again, one regards it as a manifestation of a very perfectly organized and controlled nervous system. If it is a sign of a generally lower degree of nervous excitation, then perhaps our facts are understandable. Industrial life is certainly more of a routine and less of a stimulating and exciting experience than school life. It is more necessary for the school child to be on the *qui vive* and ready to make many different kinds of adjustments than it is for the working child. In the case of rapidity of muscular motion and eye-hand coördination, it is easier to see the effect of experience. The actual processes of industry make more of a demand in this realm and give more training than does school life. It is hardest of all to see why mere strength and vital capacity should develop faster among school than among working children. Nothing but the physical culture and athletic training of the school could have a direct bearing. The difference cannot be related to mere size, since during these years working children were gaining on school children in size. Possibly strength and vital capacity are more directly influenced by the better living conditions which, to some extent, characterized our school group (see Chapter XII), than the other physical capacities measured. They may be better indices of general physical well-being than our other physical tests.

When we turn to the series of mental measurements, the situation is quite different. There were no tests in this series in which the working children systematically improved faster from year to year than the school children; in fact, no cases in which the working children improved as much from year to year as the school children. Detailed comparisons based on separate tests are not available in as great numbers as in the case of the physical tests, since the tests were modified from year to year. Comparisons based on percentile rank show increasing differences from year to year in every type of test, but greater increases in tests involving the use and interpretation of language than in other types (see Chapter V). When once more we attempt an interpretation, the most probable one seems to be that working children are, as a class, of a lower level of ability than school children and, therefore, reach their limits of development earlier, and that further, the natural advantage of the school group is enhanced by school training, particularly in the type of test involving a somewhat complex use and interpretation of language.

Another difference between the two series, which is not entirely constant but holds in so many instances as to be characteristic, is that in the case of the physical tests the differences between working and school children are greatest at the upper end of the scale where the superior members of the two groups are compared than they are at the lower end of the scale where the inferior members are compared, whereas in the mental series the reverse is in general true (see Chapter V). This statement is much more strikingly true for boys than for girls. In this respect, card-sorting behaves like a mental rather than like a physical test. The difference is one whose significance is by no means easy to interpret. When one considers the nature of the tests used, those of the physical series seem to differ from those of the mental series in the following way. The tests of the physical series, with the exception of card-sorting, are tests which call for maximum of accomplishment in one assigned task. The child is asked to blow the spirometer as high as he can, to squeeze the dynamometer as hard as he can, to tap as fast as he can for a specified time, and to hold the pencil as steady as he can, with a piece of apparatus so constructed that it allows for a maximum possible accomplishment. In the tests of the mental series, on the other hand, the measures are in terms either of the time required to complete a given task or of the percentage of perfection with which a set task is performed. The child is asked to cancel a given page of *a*'s as fast as he can, to fill in the figures on a substitution page as fast as he can, to write the omitted words on a given page as fast as he can, to solve a puzzle as fast as he can, to carry out the page of directions as fast as he can. The measure is the time required. The percentage of perfection with which he performs these various tasks is a second measure. In other instances, such as rote memory, opposites, recognition, and *Aussage*, time is not considered, but the measure is merely in terms of the percentage of perfection with which a set task is performed.

Is there any reason why, in the nature of the case, two contrasting groups, like working and school children, should show a tendency to uniformity at the lower end of the percentile scale and to wide diversity at the upper end when the measure is one of accomplishment, but a tendency to uniformity at the upper end and diversity at the lower end when the measure is one of time required for a set task, or percentage of perfection with which a set task is performed?

If the task set is too easy to call forth real effort on the part of the best of the children, easy enough so that a large proportion of them approach perfection, then it is easy to see why the difference between two groups of children of different levels of ability should appear to be less at the top than at the bottom of a scale based on perfection of performance. This explanation seems the obvious one in the case of such tests as rote memory, cause and effect, easy opposites, and the Yerkes Point Scale. However, tests that are difficult enough so that no large percentage of records lie close to perfection, for instance mutilated text, hard opposites, and the *Aussage* test, show the same tendency. If the scale is based not on perfection of performance but on the time required to complete a set task, is there then any *a priori* reason why two groups of differing levels of ability should display a greater difference between their inferior than between their superior members? Again, if the task set is too easy, so that for the best of the two groups no real effort is involved and performance resolves itself into the mere mechanics of carrying out the project, then it is easy to see why the time required by the superior should be moderately uniform and that required by the inferior should vary. However, in cases where comparatively few reach perfection and the task can, therefore, be assumed to be one which makes a real demand upon ability, there seems to be no clear reason why the time required for the task should not be a fair measure of skill in performance. In our series time measures, whether of easy or of difficult tasks, behave the same way. The differences between inferior members of the two groups are greater than those between the superior.

If the nature of the tests used is not sufficient to account for all of the differences in behavior between the mental and the physical series, then it must point to some real difference between the two groups of children. While acknowledging all the difficulties and uncertainties of interpretation of data so complex, the present interpreter believes that the method of natural selection of the school and working group in part accounts for the difference. School children are selected largely on the basis of mental ability, or to state it negatively, children are eliminated from school, so far as the school controls the situation, largely on a basis of inferior mental ability. Now, while the school is fairly successful in its project of eliminating early all those of inferior levels of ability, it is far less successful in retaining all those of superior levels of ability. In the working group, therefore, are found not only all those of the lowest mental levels, but also a goodly proportion of those at higher mental levels who have left school for a variety of reasons not related to ability to do school work. When the two groups are contrasted on the basis of mental ability, therefore, the difference between their inferior portions is found to be greater than that between their superior portions. In the case of physical abilities, no such conscious factor of elimination is involved. The school is not interested in eliminating those of inferior physical size or skill. On the contrary, physical infirmity may lead to remaining longer in school because a small and immature child has much less of a show at employment than a larger and more mature one. To be sure, there is a positive correlation between skill in our series of mental tests and skill in the physical tests, amounting to about .40. However, if contrary factors of selection were at work at the lower end, tending to push the mentally inferior out of school but keep the physically inferior in school, it would tend to produce the condition we find—relatively smaller physical than mental differences between working and school children at the lower end of the scale. The differences at the upper end may be, in part, the indirect result of factors of selection operative at the lower end.

The tendency which we are discussing is much more marked—particularly in physical tests—among boys than among girls. This sex difference is apparently related to several factors. The period of rapid adolescent growth of school boys, which falls earlier than that of working boys, tends to increase the difference between the two groups at the upper end of the scale during the first two years. Furthermore, there is evidence that boys who remain in school are a more highly selected group than girls who remain in school, which means that differences between working and school children are greater in amount for boys than for girls. Finally, there is a somewhat higher correlation between mental and physical tests in the case of boys than in that of girls. If, therefore, boys who remain in school are selected more definitely than girls on the basis of mental ability, they would also have a greater advantage in physical tests than girls. The fact that physical tests of boys show a more marked relationship to school grade completed than physical tests of girls to their school grade is an added piece of evidence of the truth of this interpretation.

The positive correlation between mental ability and various physical abilities is a point which has been brought out in many previous studies. Baldwin (1, p. 235) has listed the pieces of work which have indicated such a relationship as well as the much smaller number which have found no relationship, or a negative one. Most of the studies have accepted school grade as a measure of mental ability. Two papers not included in Baldwin's list show a relationship between size and school grade during the developmental years. Packer and Moehlman (2), in a study of growth in the Detroit public schools, have shown that children of a given age who were accelerated in school were better grown than those of the same age who were in the expected school grade. Those in the expected school grade were, in turn, better grown than those of the same age who were retarded. Pyle (3) reported the average height and the average speed in a tapping test of twelve-year-old boys found in various school grades from the first to the eighth. He found the average for both height and speed increasing from grade to grade, in spite of the uniform age of the group.

It is worth while to issue a caution against interpreting such series of facts in terms of cause and effect. Some enthusiastic nutrition workers, for instance, have been inclined to assume that the small children were undernourished and that the school retardation was the result of the undernourishment. Improve the nutrition of the child, they argue, and the school retardation will be retrieved. It seems more probable that mental superiority and physical superiority tend to occur in the same organism than that either one is directly the cause of the other. We have a general faith that both physical condition and mental condition are well worth improving for their own sakes, and furthermore that an improvement in one tends to react favorably on the other. As yet, however, we have no very accurate notion of the extent to which mental ills can be cured by improving physical conditions or physical ills cured by improving mental conditions.

References

(1) Baldwin, Bird T.—*The Physical Growth of Children from Birth to Maturity.* Iowa City: University of Iowa, 1922.
(2) Packer, Paul C. and Moehlman, Arthur B.—"A Preliminary Study of Standards of Growth in the Detroit Public Schools," *The Detroit Educational Bulletin,* 1921, No. 5.
(3) Pyle, W. H.—"The Relation of Mental to Physical Development," *Journal of Delinquency,* 1918, 3, 210–212.

CHAPTER X

INDUSTRIAL HISTORIES

The form in which industrial histories were kept has already been stated (see Chapter II). The facts recorded on the industrial-history card were dependent in most instances on the statement of the children. There were several reasons for considering their statements reliable. The reports were given either at the time the child changed from one position to the next, when all the facts about the previous employment were fresh in his mind, or at the time of the annual laboratory test, when the child was still in the position under discussion. It is of course true that the child-labor law was not perfectly enforced. Some changes of position took place which were not recorded in the employment-certificate office and were therefore unknown to the laboratory at the time. These positions could not be recorded until the time of the yearly examination. Statements about them depended on the child's memory for part of a year. Boys over sixteen years of age were not required to have employment certificates. For the last two years, therefore, we were dependent in the case of boys on statements covering a period of a year. There were various ways of checking the accuracy of children's statements about wages and conditions of employment. The wages of the entire group of children employed on certificate were recorded in the certificate office. We knew the general range of wages paid to children in each occupation, and in each of the establishments employing large numbers of children. Frequent conferences with employers checked the children's statements. In any cases in which we had reason to doubt the child's statement, the employer was appealed to for verification. We consider the statistics presented in this chapter decidedly more accurate than most sets of statistics on the same points. The records were made individually and checked with unusual care. Only statistics taken from payrolls and office records of employers would have a higher degree of reliability. Such records were not open to us in a sufficient number of cases to base statistics for our group upon them.

In this chapter, statistics of employment will be presented covering the following points: total yearly earnings; average weekly wage for the weeks employed; number of weeks employed; number of positions held; kinds of work done; and kinds of industries entered. Since statistics of employment were all kept in terms of school grade completed, the tables recording school grade in relation to each phase of industrial life will be included in this chapter. Except for the factor of school grade, the relation of industrial life to other elements of the situation will be discussed in later chapters.

In considering wage statistics, the years covered by these records must be kept in mind. Those of the first are records of 1911–1912 and those of the fourth year are records of 1915–1916. In terms of age, the first year records are children of fourteen to fifteen, and the fourth year records children of seventeen to eighteen.

Statistics for each year are presented separately. Only industrial histories for children employed as much as twenty-six weeks out of the fifty-two are considered in this summary. A study of the instances in which children had worked less than twenty-six weeks showed that the reason for the unemployment was not inability to obtain work on the part of children who wanted it. These were children who had returned to school, were staying at home because their help was needed, had left the city, or were ill. It was not fair, therefore, to call their time out of work unemployment. They had retired from the industrial world.

Total Yearly Earnings

The total yearly earnings for boys are reported in the form of ten-percentile scales. The ten-percentile scales for each of the four years are presented in Table 572. They show a steady increase in earning capacity from year to year represented by medians of $186, $259, $354, and $408. These are pre-war wages. The rise due to the war was not reflected in children's wages in Cincinnati until after 1916.

The ten-percentile scales made out separately for each school grade are presented in Table 573. The table shows but a slight relationship between school grade completed at fourteen and earning capacity during the first four years. During the first two years the median of the fifth grade is lowest of any, but this ceases to be true in the third and fourth year. There is a tendency for the eighth grade to contain fewer individuals of very low earning capacity than the lower grades, but it is equally true that the eighth grade contains fewer individuals of very high earning capacity. The table shows that the boys who have completed the seventh or eighth grade at fourteen years have no clear advantage in earning capacity during the first four years over those who have completed the fifth or sixth grade.

The ten-percentile scales for total yearly earnings for girls are given in Table 574. Like the boys, the girls increase their earning capacity materially from year to year. The successive medians for the four years are $150, $216, $285, and $334. Not only do boys earn more than girls at the start, but the difference is an increasing one from year to year. The first year boys' wages are $36 higher than girls'; the second year, $43 higher; the third year, $69 higher; and the fourth year, $74 higher.

TABLE 572

TEN-PERCENTILE SCALE OF YEARLY EARNINGS

Boys

Percentiles	First Year	Second Year	Third Year	Fourth Year
10	$142	$184	$261	$301
20	157	204	293	330
30	167	223	316	362
40	179	240	333	378
50	186	259	354	408
60	198	274	375	453
70	207	295	414	487
80	227	323	462	534
90	258	364	524	621
No. of Cases	379	384	327	288

TABLE 573

TEN-PERCENTILE SCALE OF YEARLY EARNINGS BY SCHOOL GRADES COMPLETED

Boys

Percentiles	First Year				Second Year			
	Grade V	Grade VI	Grade VII	Grade VIII	Grade V	Grade VI	Grade VII	Grade VIII
10	$134	$151	$149	$146	$171	$179	$194	$202
20	150	164	164	155	188	197	208	231
30	158	172	173	162	206	216	228	239
40	167	185	181	181	224	234	242	256
50	176	193	187	190	245	250	251	267
60	184	204	193	204	258	275	265	281
70	196	217	201	216	279	301	296	301
80	215	236	217	230	295	324	317	319
90	253	263	251	251	346	376	353	354
No. of Cases	105	114	101	59	112	111	100	61

Percentiles	Third Year				Fourth Year			
	Grade V	Grade VI	Grade VII	Grade VIII	Grade V	Grade VI	Grade VII	Grade VIII
10	$242	$263	$238	$284	$291	$299	$260	$314
20	311	291	272	317	335	330	304	344
30	322	313	299	334	368	361	326	368
40	336	330	317	352	379	385	352	380
50	361	358	334	365	404	420	377	417
60	392	386	355	370	430	463	407	461
70	440	414	411	396	483	493	464	480
80	466	476	449	448	524	548	496	537
90	537	539	499	484	629	642	544	583
No. of Cases	93	92	86	56	81	78	82	47

TABLE 574 — TEN-PERCENTILE SCALE OF YEARLY EARNINGS

Girls

Percentiles	First Year	Second Year	Third Year	Fourth Year
10	$100	$137	$185	$226
20	119	166	217	263
30	132	186	238	287
40	140	202	259	316
50	150	216	285	334
60	160	234	318	357
70	171	250	344	385
80	187	275	379	420
90	212	310	413	462
No. of Cases . . .	275	259	207	172

TABLE 575 — TEN-PERCENTILE SCALE OF YEARLY EARNINGS BY SCHOOL GRADES COMPLETED

Girls

Percentiles	First Year				Second Year			
	Grade V	Grade VI	Grade VII	Grade VIII	Grade V	Grade VI	Grade VII	Grade VIII
10	$112	$100	$114	$112	$113	$138	$129	$100
20	120	116	123	122	143	170	173	148
30	129	128	133	129	167	189	188	170
40	134	144	145	141	186	208	201	186
50	139	156	154	149	198	222	210	202
60	147	165	163	161	210	240	232	225
70	156	176	177	182	235	268	252	235
80	171	188	194	195	253	287	276	255
90	185	215	215	217	270	318	296	299
No. of Cases	55	85	84	51	53	76	82	48

Percentiles	Third Year				Fourth Year			
	Grade V	Grade VI	Grade VII	Grade VIII	Grade V	Grade VI	Grade VII	Grade VIII
10	$178	$199	$179	$186	$232	$260	$202	$237
20	197	227	205	216	282	268	253	262
30	233	244	234	238	317	283	278	285
40	255	269	250	254	332	311	315	306
50	273	298	283	282	344	327	337	327
60	310	319	331	314	355	361	368	343
70	324	346	359	336	365	395	420	359
80	350	376	397	362	428	413	427	386
90	400	417	424	366	488	498	465	429
No. of Cases	35	62	72	38	31	46	64	31

The ten-percentile scales for the grades separately for each of the four years are presented in Table 575. There is in these tables even less indication of a positive relationship between school grade completed at fourteen and earning capacity during the first four years than in the case of the boys. Indeed, in the third and fourth years, the girls of the eighth grade, like the boys, have fewer individuals of very high earning capacity than those of the fifth or sixth. On the whole the girls of the sixth grade are somewhat better wage-earners than those of any other grade.

AVERAGE WEEKLY WAGE

The total yearly earning capacity of children is the product of their weekly wage and the number of weeks they are employed. Wages are frequently judged in terms of weekly rate without reference to periods of unemployment. To give us a fair average weekly wage for each year of employment, the total yearly wage was divided by the number of weeks employed. The scales for weekly wage for each year are made on this basis—an average weekly wage for the weeks employed.

The ten-percentile scales of weekly wages for boys, for each of the first four years of employment, are given in Table 576. The medians for the four years are $3.83, $5.20, $7.11, and $8.33. Earning capacity increases much faster at the upper than at the lower end of the scale. While the ten-percentile wage increases from $3.12 for the first year to $4.15 for the fourth year, the ninety-percentile wage increases from $5.15 for the first year to $12.22 during the fourth year.

The ten-percentile scales for the school grades separately are given in Table 577. They show that average weekly wage during the first four

TABLE 576

TEN-PERCENTILE SCALE OF AVERAGE WEEKLY WAGE FOR THE NUMBER OF WEEKS EMPLOYED

Boys

PERCENTILES	First Year	Second Year	Third Year	Fourth Year
10	$3.12	$3.90	$4.95	$6.21
20	3.32	4.24	6.02	6.86
30	3.53	4.61	6.29	7.33
40	3.67	4.93	6.66	7.84
50	3.83	5.20	7.11	8.33
60	4.00	5.61	7.60	9.13
70	4.22	5.99	8.25	9.79
80	4.60	6.60	9.07	10.70
90	5.15	7.61	10.15	12.22
No. of Cases . . .	379	384	327	288

years bears no consistent relation to school grade completed. The eighth-grade boy who enters industry at fourteen has no greater earning power than the fifth-grade boy. Indeed, in the third and fourth years, those of highest earning capacity are found in the lower rather than in the upper grades. The important fact is the lack of relationship between school grade completed at fourteen years and earning capacity between fourteen and eighteen years measured by average weekly wage.

The ten-percentile scales for girls for average weekly wage during each of the first four years in industry are presented in Table 578. The medians for the successive years are $3.10, $4.41, $5.97, and $6.66. In the case of the girls, the upper and lower parts of the scale increase at about the same proportionate rate. The ten-percentile increase is from $2.29 during the first year to $5.05 during the fourth, while the ninety-percentile

TABLE 577

TEN-PERCENTILE SCALE OF AVERAGE WEEKLY WAGE FOR THE NUMBER OF WEEKS EMPLOYED — BY SCHOOL GRADE

Boys

Percentiles	First Year				Second Year			
	Grade V	Grade VI	Grade VII	Grade VIII	Grade V	Grade VI	Grade VII	Grade VIII
10	$3.09	$3.14	$3.14	$3.08	$3.88	$3.82	$3.81	$4.39
20	3.30	3.43	3.33	3.24	4.15	4.19	4.14	4.66
30	3.47	3.61	3.52	3.43	4.56	4.47	4.54	4.96
40	3.61	3.74	3.66	3.63	4.84	4.94	4.78	5.22
50	3.74	3.95	3.79	3.85	5.19	5.18	5.08	5.54
60	3.93	4.16	3.92	4.05	5.46	5.69	5.50	5.84
70	4.18	4.46	4.09	4.19	5.82	5.99	6.05	6.04
80	4.60	4.76	4.41	4.45	6.69	6.49	6.50	6.65
90	5.12	5.55	4.99	5.01	7.73	7.97	7.00	7.74
No. of Cases	105	114	101	59	112	111	100	61

Percentiles	Third Year				Fourth Year			
	Grade V	Grade VI	Grade VII	Grade VIII	Grade V	Grade VI	Grade VII	Grade VIII
10	$5.29	$5.22	$5.10	$5.72	$6.22	$6.09	$6.28	$6.37
20	6.10	5.87	5.64	6.30	7.08	6.48	6.79	7.03
30	6.45	6.24	6.09	6.67	7.40	7.24	7.30	7.36
40	6.78	6.66	6.34	7.01	7.80	7.77	7.86	8.06
50	7.41	7.21	6.65	7.15	8.28	8.49	8.25	8.39
60	7.86	7.64	7.08	7.45	9.08	9.15	9.07	9.28
70	8.59	8.20	7.80	7.90	9.89	10.08	9.54	9.74
80	9.15	9.58	8.85	8.70	10.63	11.10	10.30	10.20
90	10.34	10.41	9.80	9.23	12.39	12.55	11.95	11.15
No. of Cases	93	92	86	56	81	78	82	47

TABLE 578 — TEN-PERCENTILE SCALE OF AVERAGE WEEKLY WAGE FOR THE NUMBER OF WEEKS EMPLOYED

Girls

Percentiles	First Year	Second Year	Third Year	Fourth Year
10	$2.29	$3.25	$4.11	$5.05
20	2.58	3.59	4.58	5.40
30	2.78	3.87	5.08	5.90
40	2.93	4.16	5.56	6.28
50	3.10	4.41	5.97	6.66
60	3.28	4.78	6.41	7.11
70	3.51	5.14	7.11	7.57
80	3.80	5.60	7.98	8.24
90	4.28	6.23	8.33	9.20
No. of Cases . . .	275	259	207	172

TABLE 579 — TEN-PERCENTILE SCALE OF AVERAGE WEEKLY WAGE FOR THE NUMBER OF WEEKS EMPLOYED — BY SCHOOL GRADE

Girls

Percentiles	First Year				Second Year			
	Grade V	Grade VI	Grade VII	Grade VIII	Grade V	Grade VI	Grade VII	Grade VIII
10	$2.23	$2.41	$2.32	$2.16	$3.26	$3.47	$3.21	$3.14
20	2.60	2.75	2.56	2.41	3.49	3.70	3.65	3.38
30	2.72	2.90	2.79	2.62	3.79	4.08	3.89	3.62
40	2.84	3.04	2.97	2.76	4.01	4.24	4.13	4.02
50	2.97	3.20	3.16	2.95	4.27	4.55	4.50	4.35
60	3.12	3.37	3.37	3.15	4.49	4.97	4.89	4.61
70	3.30	3.56	3.60	3.71	4.90	5.50	5.31	5.03
80	3.47	3.80	3.88	4.09	5.15	5.72	5.63	5.60
90	3.72	4.22	4.47	4.49	5.59	6.47	6.14	6.15
No. of Cases	55	85	84	51	53	76	82	48

Percentiles	Third Year				Fourth Year			
	Grade V	Grade VI	Grade VII	Grade VIII	Grade V	Grade VI	Grade VII	Grade VIII
10	$4.05	$4.23	$3.93	$4.23	$5.02	$5.09	$4.60	$5.02
20	4.40	4.62	4.56	4.60	5.60	5.35	5.35	5.52
30	4.82	4.93	4.86	4.84	6.19	5.80	5.92	5.74
40	5.25	5.35	5.38	5.15	6.45	6.29	6.28	5.96
50	5.63	5.84	5.84	5.62	6.75	6.70	6.84	6.42
60	5.92	6.35	6.30	6.08	7.08	7.20	7.27	6.72
70	6.32	7.02	6.87	6.46	7.47	7.69	7.80	6.98
80	7.00	7.37	7.88	7.14	8.45	8.08	8.85	7.90
90	8.25	8.45	8.95	7.22	9.48	9.70	9.36	8.37
No. of Cases	35	62	72	38	31	46	64	31

increase is from $4.28 during the first year to $9.20 during the fourth. In absolute values, the increases are greater at the ninety-percentile point.

The ten-percentile scales for each grade separately are presented in Table 579. As in the case of the boys, these tables show no positive relationship between school grade completed at fourteen and earning capacity between fourteen and eighteen. By the fourth year there is a slight negative relationship. The fifth-grade girls are by that time the best wage-earners.

NUMBER OF WEEKS EMPLOYED

The tables for number of weeks employed have no records below twenty-six weeks, since, as we have already explained, those employed less than twenty-six weeks were excluded from the industrial summaries and are considered elsewhere. In estimating the time employed, each working day was taken into consideration. If a child were unemployed for a day or two while hunting for work, those days were subtracted from his total number of working days.

Table 580 gives the number and the percentage of boys employed during the entire fifty-two weeks, and by periods of two weeks down to twenty-six weeks. Of the sixty boys recorded as employed less than twenty-six weeks during the first two years, the reasons for the unem-

TABLE 580

NUMBER OF WEEKS EMPLOYED DURING THE YEAR

Boys

WEEKS	FIRST YEAR		SECOND YEAR		THIRD YEAR		FOURTH YEAR	
	No. Cases	Per Cent	No. Cases	Per Cent	No. Cases	Per Cent	No. Cases	Per Cent
52-	212	55.9	246	64.1	250	76.5	211	73.3
51–50. . . .	49	12.9	37	9.6	15	4.6	11	3.8
49–48. . . .	21	5.6	18	4.7	15	4.6	13	4.5
47–46. . . .	17	4.5	21	5.5	12	3.7	11	3.8
45–44. . . .	13	3.4	9	2.4	7	2.1	3	1.0
43–42. . . .	16	4.2	11	2.9	8	2.4	12	4.2
41–40. . . .	7	1.8	12	3.1	4	1.2	8	2.8
39–38. . . .	13	3.4	4	1.0	3	.9	4	1.4
37–36. . . .	9	2.4	4	1.0	3	.9	2	.7
35–34. . . .	6	1.6	3	.8	3	.9	5	1.7
33–32. . . .	2	.5	4	1.0	2	.6	3	1.0
31–30. . . .	4	1.1	4	1.0	3	.9	1	.4
29–28. . . .	5	1.3	5	1.3	0	.0	2	.7
27–26. . . .	5	1.3	6	1.6	2	.6	2	.7
Total . .	379	99.9	384	100.0	327	99.9	288	100.0

ployment were that they had returned to school, had left town, or were working for parents without wages. The number who might have belonged to the floating, irregular workers was so small as to be negligible. There were about ten the first year, and fifteen the next, out of a total of somewhat more than four hundred cases who might have belonged in this group. The office lost track of them and was not able to complete their records. It seems fair, therefore, to regard our tables as representative of the entire group of employed children, since most of those excluded on the ground that they were employed less than twenty-six weeks were not legitimately classed as employed children at all.

The most striking thing about the table is the regularity of employment during these early years. During each year more than half of the entire group were employed throughout the year, without the loss of a single week. Three-fourths or more of them each year were employed for fifty or more weeks out of the fifty-two. Employment becomes increasingly steady during the first three years. The proportion employed without a break is 55.9 per cent the first year, 64.1 per cent the second year, and 76.5 per cent the third year. The proportion losing eight weeks more of employment is 17.6 per cent the first year, 13.7 per cent the second, and 8.4 per cent the third. The fourth year shows a record for steadiness of employment somewhat less than that of the third, which may be due to the disturbed industrial conditions of the early war period.

The relation between school grade completed and steadiness of employment is shown in Table 581. There is a general relationship between school grade completed and steadiness of employment, such that on the whole upper-grade children have better records for steadiness than lower-grade children. The fifth grade shows the largest proportion of unemployment each year during the first four years. The chief practical conclusions to be drawn are that, on the whole, beginners in industry under such conditions as those of Cincinnati are steady workers, but that boys of fourteen who have completed only the fifth grade are less likely to be steady in employment than those who have completed one of the higher grades.

Table 582, which gives the number of weeks employed for girls, shows a similar condition to that of boys. Omissions of girls employed less than twenty-six weeks were accounted for chiefly under the heads: returned to school, helping at home, and left town. Forty-nine out of sixty omissions the first year and fifty-four out of seventy-six the second year were thus accounted for. Death and marriage accounted for three more cases each year. The number who may have fallen in the class of irregular workers is thus negligible and our tables can be taken as representative of the entire group of industrial girls.

The increase in steadiness of employment from year to year is striking.

TABLE 581

NUMBER OF WEEKS EMPLOYED DURING THE YEAR — BY SCHOOL GRADE COMPLETED

Boys

First Year

No. of Weeks Employed	Grade V		Grade VI		Grade VII		Grade VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
52	44	41.9	63	55.3	65	64.3	40	67.8
51–50	19	18.1	14	12.3	13	12.9	3	5.1
49–48	7	6.7	8	7.0	3	3.0	3	5.1
47–46	6	5.7	4	3.5	3	3.0	4	6.8
45–44	3	2.9	4	3.5	4	4.0	2	3.4
43–42	3	2.9	6	5.3	5	4.9	2	3.4
41–40	2	1.9	4	3.5	1	1.0	0	.0
39–38	7	6.7	3	2.7	3	3.0	0	.0
37–36	7	6.7	1	.9	1	1.0	0	.0
35–34	1	.9	2	1.8	2	2.0	1	1.7
33–32	2	1.9	0	.0	0	.0	0	.0
31–30	0	.0	2	1.8	0	.0	2	3.4
29–28	2	1.9	1	.9	1	1.0	1	1.7
27–26	2	1.9	2	1.8	0	.0	1	1.7
Total . .	105	100.1	114	100.3	101	100.1	59	100.1

Second Year

No. of Weeks Employed	Grade V		Grade VI		Grade VII		Grade VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
52	61	54.5	76	68.5	69	69	40	65.6
51–50	11	9.8	12	10.8	7	7	7	11.4
49–48	3	2.7	3	2.7	8	8	4	6.6
47–46	7	6.3	4	3.6	6	6	4	6.6
45–44	7	6.3	1	.9	1	1	0	.0
43–42	5	4.4	3	2.7	2	2	1	1.6
41–40	6	5.4	3	2.7	2	2	1	1.6
39–38	3	2.7	0	.0	0	0	1	1.6
37–36	1	.9	0	.0	2	2	1	1.6
35–34	1	.9	2	1.8	0	0	0	.0
33–32	4	3.6	0	.0	0	0	0	.0
31–30	2	1.8	0	.0	1	1	1	1.6
29–28	1	.9	4	3.6	0	0	0	.0
27–26	0	.0	3	2.7	2	2	1	1.6
Total . . .	112	100.2	111	100.0	100	100	61	99.8

TABLE 581—*Continued*

Boys

THIRD YEAR

No. of Weeks Employed	Grade V		Grade VI		Grade VII		Grade VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
52	67	72.0	72	78.3	68	79.1	43	76.6
51–50	8	8.6	1	1.1	3	3.6	3	5.4
49–48	5	5.4	5	5.4	2	2.3	3	5.4
47–46	3	3.3	3	3.3	4	4.7	2	3.6
45–44	2	2.2	3	3.3	1	1.2	1	1.8
43–42	1	1.1	2	2.2	3	3.6	2	3.6
41–40	1	1.1	2	2.2	1	1.2	0	.0
39–38	1	1.1	2	2.2	0	.0	0	.0
37–36	0	.0	0	.0	2	2.3	1	1.8
35–34	2	2.2	1	1.1	0	.0	0	.0
33–32	2	2.2	0	.0	0	.0	0	.0
31–30	0	.0	1	1.1	2	2.3	0	.0
29–28	0	.0	0	.0	0	.0	0	.0
27–26	1	1.1	0	.0	0	.0	1	1.8
Total . . .	93	100.3	92	100.2	86	100.3	56	100.2

FOURTH YEAR

No. of Weeks Employed	Grade V		Grade VI		Grade VII		Grade VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
52	50	61.7	60	76.9	63	76.8	38	80.9
51–50	8	10.0	0	.0	3	3.7	0	.0
49–48	5	6.2	3	3.9	2	2.4	3	6.4
47–46	1	1.2	6	7.7	3	3.7	1	2.1
45–44	1	1.2	1	1.3	0	.0	1	2.1
43–42	5	6.2	3	3.9	3	3.7	1	2.1
41–40	5	6.2	0	.0	2	2.4	1	2.1
39–38	3	3.7	0	.0	0	.0	1	2.1
37–36	1	1.2	0	.0	1	1.2	0	.0
35–34	1	1.2	2	2.6	1	1.2	1	2.1
33–32	0	.0	2	2.6	1	1.2	0	.0
31–30	1	1.2	0	.0	0	.0	0	.0
29–28	0	.0	1	1.3	1	1.2	0	.0
27–26	0	.0	0	.0	2	2.4	0	.0
Total . . .	81	100.0	78	100.2	82	99.9	47	99.9

TABLE 582

NUMBER OF WEEKS EMPLOYED DURING THE YEAR

Girls

No. of Weeks Employed	First Year		Second Year		Third Year		Fourth Year	
	No. Cases	Per Cent	No. Cases	Per Cent	No. Cases	Per Cent	No. Cases	Per Cent
52	137	49.8	153	59.1	158	76.3	144	83.7
51–50	42	15.3	30	11.6	12	5.8	4	2.3
49–48	19	6.9	19	7.3	8	3.8	7	4.1
47–46	11	4.0	7	2.7	5	2.4	1	.6
45–44	10	3.6	9	3.5	4	1.9	3	1.7
43–42	6	2.2	7	2.7	4	1.9	3	1.7
41–40	8	2.9	4	1.6	3	1.5	0	.0
39–38	9	3.3	5	1.9	4	1.9	2	1.2
37–36	3	1.1	3	1.2	1	.5	2	1.2
35–34	5	1.7	2	.8	2	1.0	2	1.2
33–32	4	1.4	6	2.4	1	.5	0	.0
31–30	9	3.3	4	1.6	1	.5	1	.6
29–28	5	1.8	5	1.9	3	1.4	3	1.7
27–26	7	2.6	5	1.9	1	.5	0	.0
Total . . .	275	99.9	259	100.2	207	99.9	172	100.0

The proportion who had no unemployment was 50 per cent the first year, 59 per cent the second, 76 per cent the third, and 84 per cent the fourth. The proportion unemployed for eight weeks or more was 20.1 per cent the first year, 16 per cent the second year, 10 per cent the third year, and 8 per cent the fourth year. During the first two years girls show more unemployment than boys, but during the third and fourth years they equal or excel them in steadiness.

The relationship between school grade completed and number of weeks employed during the first four years is shown in Table 583. There is no very consistent tendency in the tables. During the first two years the fifth-grade girls show inferior records for steadiness of employment, but during the third and fourth years they compare favorably with upper grades. In the case of girls then, the fact that there is more unemployment during the first two years in industry among girls who have completed only the fifth grade than among girls who have completed a higher grade is the only relationship discoverable between steadiness of employment and school grade completed.

The prevailing idea that beginners are unemployed more than they are employed during the first year or two of labor gets no confirmation from these tables. Doubtless conditions differ from city to city, and Cincinnati may present exceptionally stable conditions.

TABLE 583

NUMBER OF WEEKS EMPLOYED DURING THE YEAR – BY SCHOOL GRADE COMPLETED

Girls

First Year

No. of Weeks Employed	Grade V		Grade VI		Grade VII		Grade VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
52	24	43.6	35	41.2	49	58.3	29	56.8
51–50	6	10.9	18	21.1	12	14.2	6	11.8
49–48	7	12.7	5	5.9	3	3.6	4	7.8
47–46	3	5.4	0	.0	8	9.5	0	.0
45–44	3	5.4	1	1.2	4	4.7	1	2.0
43–42	2	3.7	2	2.3	1	1.2	2	3.9
41–40	1	1.8	5	5.9	1	1.2	1	2.0
39–38	2	3.7	3	3.6	1	1.2	3	5.7
37–36	1	1.8	1	1.2	0	.0	1	2.0
35–34	0	.0	3	3.6	1	1.2	1	2.0
33–32	0	.0	3	3.6	0	.0	1	2.0
31–30	2	3.7	4	4.6	2	2.4	1	2.0
29–28	1	1.8	3	3.6	0	.0	1	2.0
27–26	3	5.4	2	2.3	2	2.4	0	.0
Total . . .	55	99.9	85	100.1	84	99.9	51	100.0

Second Year

No. of Weeks Employed	Grade V		Grade VI		Grade VII		Grade VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
52	23	43.4	49	64.5	53	64.6	28	58.3
51–50	8	15.1	9	11.8	10	12.2	3	6.3
49–48	4	7.6	5	6.6	5	6.1	5	10.4
47–46	3	5.7	1	1.3	1	1.2	2	4.2
45–44	1	1.9	3	3.9	3	3.6	2	4.2
43–42	3	5.7	3	3.9	1	1.2	0	.0
41–40	2	3.8	0	.0	1	1.2	1	2.1
39–38	1	1.9	2	2.6	0	.0	2	4.2
37–36	1	1.9	1	1.3	0	.0	1	2.1
35–34	1	1.9	0	.0	1	1.2	0	.0
33–32	2	3.8	2	2.6	1	1.2	1	2.1
31–30	1	1.9	1	1.3	2	2.4	0	.0
29–28	2	3.8	0	.0	1	1.2	2	4.2
27–26	1	1.9	0	.0	3	3.6	1	2.1
Total . . .	53	100.3	76	99.8	82	99.9	48	100.2

TABLE 583—*Continued*

Girls

THIRD YEAR

NO. OF WEEKS EMPLOYED	GRADE V		GRADE VI		GRADE VII		GRADE VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
52	26	74.3	50	80.6	51	70.8	31	81.6
51–50	2	5.7	6	9.7	3	4.2	1	2.6
49–48	2	5.7	0	.0	6	8.4	0	.0
47–46	0	.0	1	1.6	3	4.2	1	2.6
45–44	2	5.7	0	.0	2	2.8	0	.0
43–42	1	2.9	1	1.6	1	1.4	1	2.6
41–40	1	2.9	0	.0	2	2.8	0	.0
39–38	0	.0	2	3.2	1	1.4	1	2.6
37–36	0	.0	0	.0	1	1.4	0	.0
35–34	0	.0	0	.0	0	.0	2	5.3
33–32	0	.0	0	.0	1	1.4	0	.0
31–30	0	.0	1	1.6	0	.0	0	.0
29–28	1	2.9	1	1.6	1	1.4	0	.0
27–26	0	.0	0	.0	0	.0	1	2.6
Total	35	100.1	62	99.9	72	100.2	38	99.9

FOURTH YEAR

NO. OF WEEKS EMPLOYED	GRADE V		GRADE VI		GRADE VII		GRADE VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
52	28	90.3	39	84.8	51	79.7	26	83.9
51–50	0	.0	1	2.2	2	3.1	1	3.2
49–48	1	3.2	1	2.2	4	6.3	1	3.2
47–46	1	3.2	0	.0	0	.0	0	.0
45–44	0	.0	1	2.2	1	1.6	1	3.2
43–42	0	.0	2	4.3	0	.0	1	3.2
41–40	0	.0	0	.0	0	.0	0	.0
39–38	0	.0	0	.0	1	1.6	1	3.2
37–36	0	.0	1	2.2	1	1.6	0	.0
35–34	1	3.2	0	.0	1	1.6	0	.0
33–32	0	.0	0	.0	0	.0	0	.0
31–30	0	.0	0	.0	1	1.6	0	.0
29–28	0	.0	1	2.2	2	3.1	0	.0
27–26	0	.0	0	.0	0	.0	0	.0
Total	31	99.9	46	100.1	64	100.2	31	99.9

NUMBER OF POSITIONS HELD

The number of positions held by boys each year for the first four years is summed up in Table 584. The table shows a decrease in the number of positions held each year during the first four years. The average number per year for the successive years was 2.2; 1.9; 1.7; and 1.5. The

TABLE 584 — NUMBER OF POSITIONS HELD

Boys

No. of Positions	First Year		Second Year		Third Year		Fourth Year	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1	140	37.0	173	45.1	184	56.3	185	64.2
2	119	41.4	119	31.0	87	26.6	62	21.5
3	66	17.4	52	13.5	43	13.2	31	10.8
4	33	8.7	29	7.6	10	3.1	7	2.4
5	12	3.2	8	2.1	3	.9	3	1.0
6	5	1.3	1	.3				
7	3	.8	2	.5				
8	1	.3	0	.0				
Total . .	379	100.1	384	100.1	327	99.9	288	99.9
Average No. of Positions per boy . .	2.2		1.9		1.7		1.5	

TABLE 585

NUMBER OF POSITIONS HELD DURING FOUR YEARS BY BOYS HAVING CONSECUTIVE RECORDS OF EMPLOYMENT FOR FOUR YEARS

No. of Positions	No. of Cases	Per Cent
1	8	3.
2	39	15.
3	55	22.
4	38	15.
5	31	12.
6	30	12.
7	13	5.
8	16	6.
9	8	3.
10	8	3.
11	4	2.
12	3	1.
13	1	.4
Total	255	99.4

percentage of boys holding not more than two positions during the year in the successive years was 68.4; 76.0; 82.9; and 85.9. Table 584, from which these figures are drawn, is made up by considering the record of each year separately. Thus a position which was held consecutively for four years would be recorded each year as one position. To give an idea of the actual number of positions held throughout the four years, all of the records which were complete for the four years were summed up in terms of the number of positions held during the first four years (Table 585). The table shows that 55 per cent of the boys held not more than four positions during the four years, an average of one a year. Eighty per cent of them held not more than six positions during the four years, or an average of one and a half positions a year.

TABLE 586

NUMBER OF POSITIONS HELD – BY SCHOOL GRADE COMPLETED

Boys

First Year

No. of Positions	Grade V		Grade VI		Grade VII		Grade VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1	30	28.6	39	34.2	45	44.5	26	44.1
2	30	28.6	34	29.8	34	33.7	21	35.6
3	22	21.0	26	22.8	10	9.9	8	13.6
4	10	9.5	9	8.0	10	9.9	4	6.8
5	7	6.7	4	3.5	1	1.0	0	.0
6	3	2.9	1	.9	1	1.0	0	.0
7	2	1.9	1	.9	0	.0	0	.0
8	1	.9	0	.0	0	.0	0	.0
Total . . .	105	100.1	114	100.1	101	100.0	59	100.1

Second Year

No. of Positions	Grade V		Grade VI		Grade VII		Grade VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1	41	36.6	49	44.1	56	56	27	44.2
2	39	34.8	35	31.5	26	26	19	31.2
3	15	13.4	14	12.6	14	14	9	14.7
4	11	9.8	9	8.1	4	4	5	8.2
5	5	4.5	2	1.8	0	0	1	1.6
6	0	.0	1	.9	0	0	0	.0
7	1	.9	1	.9	0	0	0	.0
8	0	.0	0	.0	0	0	0	.0
Total . . .	112	100.0	111	99.9	100	100	61	99.9

TABLE 586—*Continued*

Boys

THIRD YEAR

No. of Positions	Grade V		Grade VI		Grade VII		Grade VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1	42	45.2	52	56.5	58	67.4	32	57.1
2	29	31.2	26	28.3	17	19.8	15	26.8
3	17	18.3	10	10.8	11	12.8	5	9.0
4	3	3.2	4	4.3	0	.0	3	5.4
5	2	2.1	0	.0	0	.0	1	1.8
Total . . .	93	100.0	92	99.9	86	100.0	56	100.0

FOURTH YEAR

No. of Positions	Grade V		Grade VI		Grade VII		Grade VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1	43	53.1	52	66.7	57	69.5	33	70.2
2	24	29.5	15	19.2	12	14.6	11	23.4
3	11	13.6	8	10.3	10	12.2	2	4.3
4	1	1.2	2	2.6	3	3.7	1	2.1
5	2	2.5	1	1.3	0	.0	0	.0
Total . . .	81	100.0	78	100.1	82	100.0	47	100.0

The relation of the number of positions held to the school grade completed by the boys is presented in Table 586. The table shows a significant tendency for the boys from the upper grades to hold fewer positions than the boys from the lower grades. There is little difference between the seventh and eighth grade, but there is an entirely regular tendency for the proportion of those holding but one position a year to increase from fifth to sixth, and from sixth to seventh grade. This tendency is evident during the fourth year of employment just as it was during the first. The greater instability of the lower-grade children is also shown by the fact that the worst shifters are found almost exclusively in the two lower grades. To sum up the grade comparisons numerically the following points derived from Table 586 are presented separately: the percentage of boys in each grade holding not more than two positions a year (Table 587a); the percentage holding more than three positions a year (Table 587b); and the average number of positions held each year by the boys from each grade (Table 587c). In each of these summaries the progressively greater stability from fifth-grade to seventh-grade boys is evident. The grade differences are somewhat less striking during the fourth year of employment than they were the first year, but are still evident.

The number of positions held by girls each year during the first four years is shown in Table 588. There is a steady decrease from year to year in the number of positions held. The average number for the successive years is 2.0; 1.6; 1.4; and 1.3. The percentage of girls holding not more than two positions a year for successive years is 71.2; 86.9; 89.9; and 95.9. There were 132 girls for whom we possessed consecutive records of employment throughout the four years. The total number of positions held by them during four years is shown in Table 589. The proportion holding not more than four positions during the four years, or an average of one position a year, is 74 per cent. The proportion holding not more than six positions in four years, or an average of one and a half a year, is 90 per cent. All of these methods of summary, when compared with

TABLE 587

STABILITY OF EMPLOYMENT BY SCHOOL GRADE COMPLETED

Boys

a. Per cent of boys holding not more than two positions a year

	Grade V	Grade VI	Grade VII	Grade VIII
First year	57.2	64.1	78.2	79.6
Second year . . .	71.4	75.7	82.0	75.4
Third year	76.4	84.8	87.2	83.9
Fourth year . . .	82.6	85.9	84.1	93.6

b. Per cent of boys holding more than three positions a year

	Grade V	Grade VI	Grade VII	Grade VIII
First year	22.0	13.2	11.9	6.8
Second year . . .	15.1	11.7	4.0	9.8
Third year	5.3	4.3	.0	7.2
Fourth year . . .	3.7	3.9	3.7	2.1

c. Average number of positions per boy

	Grade V	Grade VI	Grade VII	Grade VIII
First year	2.6	2.2	1.9	1.8
Second year . . .	2.1	2.0	1.7	1.9
Third year	1.9	1.6	1.5	1.7
Fourth year . . .	1.7	1.5	1.5	1.4

TABLE 588

NUMBER OF POSITIONS HELD

Girls

No. of Positions	First Year		Second Year		Third Year		Fourth Year	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1	117	42.6	153	59.1	148	71.5	134	77.9
2	79	28.7	72	27.8	38	18.4	31	18.0
3	49	17.8	21	8.1	21	10.1	7	4.1
4	19	6.9	9	3.5				
5	6	2.2	3	1.2				
6	4	1.5	1	.4				
7	1	.3	0	.0				
Total . .	275	100.0	259	100.1	207	100.0	172	100.0
Average No. of Positions per girl. .	2.0		1.6		1.4		1.3	

TABLE 589

NUMBER OF POSITIONS HELD DURING FOUR YEARS BY GIRLS HAVING CONSECUTIVE RECORDS OF EMPLOYMENT FOR FOUR YEARS

No. of Positions	No. of Cases	Per Cent
1	6	5
2	33	25
3	27	20
4	31	24
5	8	6
6	13	10
7	7	5
8	5	4
9	0	0
10	1	1
11	1	1
12	0	0
13	0	0
Total	132	101

the corresponding figures for boys, show that girls change positions less frequently than boys.

The relation between school grade completed, and the number of positions held by girls is shown in Table 590. The trend is the same as in

TABLE 590

NUMBER OF POSITIONS HELD — BY SCHOOL GRADE COMPLETED

Girls

FIRST YEAR

No. of Positions	Grade V		Grade VI		Grade VII		Grade VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1	19	34.6	31	36.5	41	48.8	26	50.9
2	14	25.5	28	32.9	20	23.8	17	33.3
3	9	16.4	19	22.3	15	18.0	6	11.8
4	7	12.7	4	4.7	6	7.2	2	3.9
5	3	5.5	2	2.4	1	1.2	0	.0
6	3	5.5	0	.0	1	1.2	0	.0
7	0	.0	1	1.2	0	.0	0	.0
Total . .	55	100.2	85	100.0	84	100.2	51	99.9

SECOND YEAR

No. of Positions	Grade V		Grade VI		Grade VII		Grade VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1	25	47.2	47	61.8	53	64.6	28	58.3
2	16	30.1	21	27.6	22	26.8	13	27.1
3	7	13.2	4	5.3	6	7.3	4	8.3
4	3	5.7	3	4.0	1	1.2	2	4.2
5	1	1.9	1	1.3	0	.0	1	2.1
6	1	1.9	0	.0	0	.0	0	.0
7	0	.0	0	.0	0	.0	0	.0
Total . .	53	100.0	76	100.0	82	99.9	48	100.0

THIRD YEAR

No. of Positions	Grade V		Grade VI		Grade VII		Grade VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1	21	60.0	44	71.0	55	76.4	28	73.7
2	8	22.9	11	17.7	11	15.3	8	21.1
3	6	17.1	7	11.3	6	8.3	2	5.3
Total . .	35	100.0	62	100.0	72	100.0	38	100.1

TABLE 590—*Continued*

Girls

FOURTH YEAR

NO. OF POSITIONS	GRADE V		GRADE VI		GRADE VII		GRADE VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1	22	71.0	37	80.4	50	78.1	25	80.6
2	7	22.6	7	15.2	11	17.2	6	19.4
3	2	6.4	2	4.4	3	4.7	0	.0
Total . .	31	100.0	46	100.0	64	100.0	31	100.0

the case of the boys. There is a steady increase in stability from fifth to seventh grade, but little difference between seventh and eighth grade. The tendency is consistent for the first three years, but in the fourth year shows chiefly in terms of the inferiority of the fifth-grade girls. Numerical summaries of the degree of difference in terms of the percentage of girls holding not more than two positions a year, the percentage holding more than

TABLE 591

STABILITY OF EMPLOYMENT — BY SCHOOL GRADE COMPLETED

Girls

a. Per cent of girls holding not more than two positions a year

	Grade V	Grade VI	Grade VII	Grade VIII
First year	59.9	69.4	72.6	84.0
Second year . . .	77.4	89.6	91.5	85.3
Third year	82.9	88.7	91.7	94.8
Fourth year . . .	93.6	95.6	95.3	100.0

b. Per cent of girls holding more than three positions a year

	Grade V	Grade VI	Grade VII	Grade VIII
First year	13.6	8.2	9.5	4.0
Second year . . .	9.5	5.2	1.2	6.3
Third year	.0	.0	.0	.0
Fourth year . . .	.0	.0	.0	.0

c. Average number of positions per girl

	Grade V	Grade VI	Grade VII	Grade VIII
First year	2.4	2.1	1.9	1.7
Second year . . .	1.9	1.6	1.5	1.6
Third year	1.5	1.4	1.3	1.3
Fourth year . . .	1.4	1.2	1.4	1.2

three positions a year, and the average number of positions held each year are presented in Table 591. This table can be easily compared with the corresponding table for boys (Table 587). While girls are more stable by every measure used, the contrast is most striking in terms of the percentage of each sex who hold more than three positions a year. Not a single girl, after the first two years, held more than three positions a year, while boys continue to do so throughout the four years.

Kind of Work Done

The summary of the kind of work performed by the boys each year is presented in Table 592. Under miscellaneous are classified all those occupations in which not more than 1 per cent of the boys were employed. Occupations are arranged each year in the order of size, from those in which most boys were engaged to those in which fewest boys were engaged. While in the first year six kinds of work include all those in which more than 1 per cent of the boys were engaged, in the fourth year there were fourteen occupations in the group. The total number of kinds of work performed is recorded in the table based on school grade, Table 593. There were thirty-one the first year, thirty-nine the second year, forty the third year, and thirty-eight the fourth.

During the first year, the largest group of boys is classified under "errands." The term includes both the public messenger service and messenger boys for private business houses. Forty per cent of the boys begin their industrial careers as messengers. By the second year this occupation has dropped to second place, with only 20 per cent of the boys employed; the third year it occupies fourth place, with 8 per cent employed; and the fourth year it is seventh in order, with only 3 per cent employed. Factory work constitutes the largest group in every year except the first, where it has second place. It includes 31 per cent the first year, and 41 or 42 per cent each of the succeeding years. The occupation of general helper in store or office, which follows factory work and errands in numerical importance during the first two years, becomes differentiated into more specific kinds of work, such as stock keeper, helper in the shipping department, shipping clerk, salesman, or clerical worker in the third and fourth years. The printing trade, which is sixth or seventh on the list during the first two years, rises to third place in the third and fourth year. Clerical work first appears in the second year where it has sixth place, and rises to second place in the third and fourth years. The helper on the delivery wagon appears during each of the four years in a position varying from fifth to eighth, but during the third and fourth year some of the wagon boys have risen to the position of driver or chauffeur. The butcher's apprentice appears for the first time in the third year, and the plumber's assistant, cook and waiter, florist's assistant and electrician's employee appear first in the fourth year. There is some suggestion in the tables that more skilled types of work are available for sixteen- and seventeen-year-old boys than for the younger ones, even without additional schooling. Clerical work, skilled trades, and salesmanship are increasingly important from year to year.

TABLE 592

KINDS OF WORK DONE

Boys

First Year			Second Year		
Kind of Work	No. of Cases	Per Cent	Kind of Work	No. of Cases	Per Cent
1. Errands	336	40.7	1. Factory	305	41.0
2. Factory	260	31.5	2. Errands	158	21.3
3. Helper in store	69	8.3	3. Helper in office	57	7.7
4. Helper in office	45	5.4	4. Helper in store	54	7.3
5. Wagon boy	40	4.8	5. Wagon boy	37	5.0
6. Printing	19	2.3	6. Clerical	30	4.0
Miscellaneous	58	7.0	7. Printing	26	3.5
			8. Salesman	15	2.0
			Miscellaneous	61	8.2
Total	827	100.0	Total	743	100.0

Third Year			Fourth Year		
Kind of Work	No. of Cases	Per Cent	Kind of Work	No. of Cases	Per Cent
1. Factory	231	42.6	1. Factory	185	41.6
2. Clerical	52	9.6	2. Clerical	47	10.6
3. Printing	42	7.8	3. Printing	43	9.7
4. Errands	41	7.6	4. Shipping clerk	24	5.4
5. Stock keeper	28	5.2	5. Stock keeper	23	5.2
6. Shipping clerk	24	4.4	6. Salesman	21	4.7
7. Wagon boy	20	3.7	7. Errands	13	2.9
8. Salesman	16	3.0	8. Wagon boy	12	2.7
9. Driver	10	1.8	9. Gas and plumber assistant	8	1.8
10. Helper in store	8	1.5	10. Driver	7	1.6
11. Office boy	8	1.5	11. Chauffeur	7	1.6
12. Butcher's apprentice	6	1.1	12. Cook and waiter	7	1.6
13. Miscellaneous	56	10.3	13. Flower shop apprentice	5	1.1
			14. Electric company	5	1.1
			15. Miscellaneous	38	8.5
Total	542	100.1	Total	445	100.1

The relation of kind of work performed to school grade completed is shown in Table 593. The great diversity of work represented and the small number of individuals in each class make it impossible to see significant school-grade relationships except for the largest groups. To facilitate comparison a table has been prepared showing how factory work, clerical work, and errands are related to school grade (Table 594). In the case of factory work, the occupation increases in importance for every grade from the first to the fourth year of employment, but it is each year a more important occupation for lower- than for upper-grade boys. The

TABLE 593—KINDS OF WORK DONE—BY SCHOOL GRADE COMPLETED

Boys

First Year

Kind of Work	Grade V		Grade VI		Grade VII		Grade VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1. Errand boy	109	40.3	92	36.1	90	46.4	45	41.7
2. Factory work	101	37.4	92	36.1	51	26.3	16	14.8
3. Helper in store	14	5.2	20	7.9	16	8.2	19	17.6
4. Helper in office	3	1.1	15	5.9	16	8.2	11	10.2
5. Wagon boy	15	5.6	11	4.3	8	4.1	6	5.6
6. Printing	5	1.8	7	2.8	5	2.6	2	1.8
7. General utility	1	.4	3	1.2	2	1.0	2	1.8
8. Bakery	3	1.1	0	.0	1	.5	1	.9
9. Clerical	0	.0	1	.4	2	1.0	2	1.8
10. Tailor	5	1.8	0	.0	0	.0	0	.0
11. Usher in theater	5	1.8	0	.0	0	.0	0	.0
12. Newsboy	1	.4	3	1.2	0	.0	0	.0
13. Peddler	1	.4	2	.8	1	.5	0	.0
14. Kindling	0	.0	2	.8	0	.0	0	.0
15. Paper-hanger	2	.8	0	.0	0	.0	0	.0
16. Private family	1	.4	1	.4	0	.0	0	.0
17. Restaurant helper	2	.8	0	.0	0	.0	0	.0
18. Abattoir helper	0	.0	1	.4	0	.0	0	.0
19. Bank messenger	0	.0	0	.0	0	.0	1	.9
20. Bottle washer	1	.4	0	.0	0	.0	0	.0
21. Butcher	0	.0	1	.4	0	.0	0	.0
22. Coal-shute hand	0	.0	1	.4	0	.0	0	.0
23. Distillery	1	.4	0	.0	0	.0	0	.0
24. Hotel boy	0	.0	1	.4	0	.0	0	.0
25. Jeweler's apprentice	0	.0	0	.0	0	.0	1	.9
26. Salesman	0	.0	0	.0	0	.0	1	.9
27. Saloon helper	0	.0	0	.0	1	.5	0	.0
28. Soda fountain boy	0	.0	0	.0	1	.5	0	.0
29. Traveling companion	1	.4	0	.0	0	.0	0	.0
30. Watchman on boat	0	.0	1	.4	0	.0	0	.0
31. Water boy	0	.0	0	.0	0	.0	1	.9
Total	271	100.4	254	99.9	194	99.8	108	99.8

TABLE 593—*Continued*

Boys

SECOND YEAR

KIND OF WORK	GRADE V		GRADE VI		GRADE VII		GRADE VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1. Factory work	109	45.5	100	45.5	59	35.5	37	31.6
2. Errand boy	64	26.7	37	16.8	37	22.3	20	17.1
3. Helper in office	3	1.3	14	6.4	22	13.2	18	15.4
4. Helper in store	13	5.4	15	6.8	14	8.4	12	10.3
5. Wagon boy	15	6.3	15	6.8	5	3.0	2	1.7
6. Clerical work	3	1.3	2	.9	7	4.2	18	15.4
7. Printing	5	2.1	12	5.5	7	4.2	2	1.7
8. Salesman	4	1.7	7	3.2	3	1.8	1	.9
9. Bakery hand	1	.4	1	.4	3	1.8	0	.0
10. Plumber's apprentice	1	.4	1	.4	3	1.8	0	.0
11. Tailoring	3	1.3	0	.0	2	1.2	0	.0
12. Assistant cook	2	.8	2	.9	0	.0	0	.0
13. General utility	2	.8	1	.4	0	.0	1	.9
14. Newsboy	1	.4	3	1.3	0	.0	0	.0
15. Paper hanger	3	1.3	1	.4	0	.0	0	.0
16. Butcher	2	.8	1	.5	0	.0	0	.0
17. Cleaning	1	.4	0	.0	0	.0	1	.9
18. Electrical apprentice	0	.0	0	.0	0	.0	2	1.7
19. Farmhand	2	.8	0	.0	0	.0	0	.0
20. Theater usher	2	.8	0	.0	0	.0	0	.0
21. Abattoir helper	0	.0	1	.4	0	.0	0	.0
22. Carpenter's assistant	0	.0	1	.5	0	.0	0	.0
23. Coal-shute hand	0	.0	1	.4	0	.0	0	.0
24. Distillery hand	1	.4	0	.0	0	.0	0	.0
25. Florist's assistant	1	.4	0	.0	0	.0	0	.0
26. Golf caddy	0	.0	0	.0	1	.6	0	.0
27. Hotel boy	1	.4	0	.0	0	.0	0	.0
28. House-wrecking helper	0	.0	1	.5	0	.0	0	.0
29. Advertising company	0	.0	0	.0	0	.0	1	.9
30. Kindling	0	.0	1	.4	0	.0	0	.0
31. Laborer	0	.0	1	.5	0	.0	0	.0
32. Night watchman	0	.0	0	.0	1	.6	0	.0
33. Painter	0	.0	1	.4	0	.0	0	.0
34. Peddler	0	.0	0	.0	1	.6	0	.0
35. Saloon helper	0	.0	0	.0	1	.6	0	.0
36. Surveyor's assistant	0	.0	0	.0	0	.0	1	.9
37. Traveling companion	1	.4	0	.0	0	.0	0	.0
38. Watchman on boat	0	.0	1	.5	0	.0	0	.0
39. Water boy	0	.0	0	.0	0	.0	1	.9
Total	240	100.2	220	99.8	166	99.8	117	100.3

TABLE 593—*Continued*

Boys

THIRD YEAR

KIND OF WORK	GRADE V		GRADE VI		GRADE VII		GRADE VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1. Factory work	80	46.2	75	50.0	47	37.6	29	30.9
2. Clerical work	0	.0	10	6.7	20	16.0	22	23.4
3. Printing	8	4.6	17	11.3	8	6.4	9	9.6
4. Errands	22	12.7	10	6.7	5	4.0	4	4.3
5. Stock keeper and clerk	6	3.5	3	2.0	8	6.4	11	11.7
6. Shipping department	7	4.0	5	3.3	8	6.4	4	4.3
7. Wagon boy	9	5.2	4	2.7	5	4.0	2	2.1
8. Salesman	5	2.9	4	2.7	5	4.0	2	2.1
9. Driver	7	4.0	2	1.3	1	.8	0	.0
10. Helper in a store	2	1.2	2	1.3	4	3.2	0	.0
11. Office boy	1	.6	3	2.0	3	3.4	1	1.1
12. Butcher's apprentice	3	1.7	3	2.0	0	.0	0	.0
13. Plumber's assistant	3	1.7	1	.7	0	.0	1	1.1
14. Jeweler's apprentice	0	.0	0	.0	3	2.4	1	1.1
15. Peddling	0	.0	2	1.3	2	1.6	0	.0
16. Repair work (auto)	2	1.2	2	1.3	0	.0	0	.0
17. Restaurant cook	2	1.2	1	.7	0	.0	1	1.1
18. Floral shop apprentice	1	.6	0	.0	2	1.6	0	.0
19. Tinner's assistant	1	.6	0	.0	0	.0	2	2.1
20. Bill collector	1	.6	0	.0	1	.8	0	.0
21. Chauffeur	1	.6	1	.7	0	.0	0	.0
22. Drafting	1	.6	0	.0	0	.0	1	1.1
23. Lumber co. helper	1	.6	1	.7	0	.0	0	.0
24. Railroad repair work	1	.6	1	.7	0	.0	0	.0
25. Tailoring	0	.0	0	.0	1	.8	1	1.1
26. Usher in theater	2	1.2	0	.0	0	.0	0	.0
27. Watchman	1	.6	0	.0	1	.8	0	.0
28. Abattoir hand	1	.6	0	.0	0	.0	0	.0
29. Theater assistant	0	.0	0	.0	0	.0	1	1.1
30. Barber shop	1	.6	0	.0	0	.0	0	.0
31. Carpenter's assistant	0	.0	1	.7	0	.0	0	.0
32. Chemical laboratory	0	.0	0	.0	1	.8	0	.0
33. Farming	1	.6	0	.0	0	.0	0	.0
34. Garden helper	1	.6	0	.0	0	.0	0	.0
35. Navy	0	.0	0	.0	0	.0	1	1.1
36. Sign painter	0	.0	1	.7	0	.0	0	.0
37. Page in hotel	1	.6	0	.0	0	.0	0	.0
38. Riding boy for horseshoer	1	.6	0	.0	0	.0	0	.0
39. Riding as jockey	0	.0	1	.7	0	.0	0	.0
40. Traction co. wiring	0	.0	0	.0	0	.0	1	1.1
Total	173	100.3	150	100.2	125	100.	94	100.4

TABLE 593—*Continued*

Boys

FOURTH YEAR

KIND OF WORK	GRADE V		GRADE VI		GRADE VII		GRADE VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1. Factory	70	50.7	51	42.9	46	37.4	18	27.7
2. Clerical	3	2.2	9	7.6	21	17.1	14	21.5
3. Printing	6	4.4	22	18.6	8	6.5	7	10.8
4. Shipping clerk	5	3.6	7	5.9	7	5.7	5	7.7
5. Stock clerk	7	5.1	2	1.7	7	5.7	7	10.8
6. Salesman	6	4.4	5	4.2	7	5.7	3	4.6
7. Errands	5	3.6	4	3.4	4	3.3	0	.0
8. Wagon boy	4	2.9	5	4.2	3	2.4	0	.0
9. Gas and plumbers	4	2.9	2	1.7	1	.8	1	1.5
10. Driver	4	2.9	0	.0	3	2.4	0	.0
11. Chauffeur	1	.7	2	1.7	3	2.4	1	1.5
12. Cook and waiter	6	4.4	0	.0	0	.0	1	1.5
13. Flower shop (apprentice)	2	1.4	0	.0	3	2.4	0	.0
14. Electric company	0	.0	3	2.5	1	.8	1	1.5
15. Tinner's assistant	1	.7	0	.0	0	.0	3	4.6
16. Jeweler's apprentice	0	.0	0	.0	3	2.4	1	1.5
17. Office boy	1	.7	0	.0	2	1.6	0	.0
18. Bowling alley	2	1.4	0	.0	0	.0	0	.0
19. Butcher's apprentice	2	1.4	0	.0	0	.0	0	.0
20. Lumber company	1	.7	1	.8	0	.0	0	.0
21. Drafting	1	.7	0	.0	0	.0	1	1.5
22. Engineer	1	.7	0	.0	1	.8	0	.0
23. Odd jobs	1	.7	0	.0	1	.8	0	.0
24. Tailoring	1	.7	0	.0	0	.0	0	.0
25. Book binding	1	.7	0	.0	0	.0	0	.0
26. City labor work	1	.7	0	.0	0	.0	0	.0
27. Contractor's assistant	1	.7	0	.0	0	.0	0	.0
28. Sign painting assistant	0	.0	1	.8	0	.0	0	.0
29. House painting apprentice	0	.0	1	.8	0	.0	0	.0
30. Brakeman on R. R.	0	.0	1	.8	0	.0	0	.0
31. Bill collector	0	.0	0	.0	1	.8	0	.0
32. Traction co. repair work	0	.0	0	.0	0	.0	1	1.5
33. Garden helper	1	.7	0	.0	0	.0	0	.0
34. Helper in store	0	.0	0	.0	1	.8	0	.0
35. Assistant property man—theater	0	.0	0	.0	0	.0	1	1.5
36. Farming	0	.0	1	.8	0	.0	0	.0
37. Auto repair	0	.0	1	.8	0	.0	0	.0
38. Architect's apprentice	0	.0	1	.8	0	.0	0	.0
Total	138	99.7	119	100.0	123	99.8	65	99.7

proportion of fifth-grade boys in factory work is about twice as great as that of eighth-grade boys during the first year of employment and again during the fourth year. Clerical work is non-existent during the first year of employment, and it remains negligible for boys who had completed only the fifth grade. It increases every year for each grade group, but much faster for the eighth than for any other grade. Twenty-two per cent of eighth-grade boys are found in clerical work during the fourth year, 17 per cent of seventh-grade boys, 8 per cent of sixth-grade boys, and 2 per cent of fifth-grade boys. Errands, during the first year, keep about 40 per cent of the boys from each school grade busy. By the third year, 13 per cent of fifth-grade boys are still running errands, 7 per cent of sixth-grade boys, and only 4 per cent of seventh- or eighth-grade boys. By the fourth year no eighth-grade boy is running errands, and only 3 or 4 per cent of the boys from other grades are so employed. The occupations of "helper in store" and "helper in office" during the first two years show a definite relation to school grade completed. During the first year those two occupations include 6 per cent of fifth-grade boys and increase steadily to 28 per cent of eighth-grade boys. During the second year they comprise 7 per cent of fifth-grade boys and rise to 26 per cent in the eighth grade. Printing shows no regular relation to school grade in any year, except that the fifth-grade group is the smallest. The occupations of

TABLE 594

RELATION OF SCHOOL GRADE COMPLETED TO KIND OF WORK DONE

Boys

Kind of Work	Grade V Per Cent	Grade VI Per Cent	Grade VII Per Cent	Grade VIII Per Cent
Factory Work				
First year of employment	37	36	26	15
Second year of employment	45	45	36	32
Third year of employment	46	50	38	31
Fourth year of employment	51	43	37	28
Clerical Work				
First year of employment				
Second year of employment	1	1	4	15
Third year of employment	0	7	16	23
Fourth year of employment	2	8	17	22
Errands				
First year of employment	40	36	46	42
Second year of employment	27	17	22	17
Third year of employment	13	7	4	4
Fourth year of employment	4	3	3	0

stock keeper, stock clerk, and shipping clerk during the third and fourth years are represented by higher percentages in the eighth grade than in any other.

The relation between kind of work performed and school grade completed can best be summed up by saying that for the lower-grade boys factory work includes from 40 to 50 per cent each year, with a tendency to be increasingly important from year to year. For the upper-grade boys also factory work constitutes the largest occupation—from 25 to 45 per cent—but it becomes relatively less important from year to year. Aside from factory work and errands, fifth-grade boys are not represented in large numbers in any occupation during any year. Occupations in the "clerk" class, such as simple clerical work, shipping or stock clerk, are represented from year to year by increasingly large proportions in the upper grades. The printing trade is surprisingly unrelated to school grade completed except for its prejudice against fifth-grade boys. The greater number of occupations listed are represented by such small numbers of individuals that no conclusions can be drawn. Boys are tried in a haphazard way in many occupations in which they do not make good and remain but a short time. For this reason a very few cases in tables like these we are considering have no significance.

The kinds of work performed by girls are summed up in Table 595. The number of occupations in which more than 1 per cent of the girls is employed is nine the first year, seven the second, eleven the third year, and eleven the fourth. These figures do not differ radically from the corresponding figures for boys, which increase from six occupations the first year to fourteen in the fourth. The total number of kinds of work listed for girls (Table 596) is sixteen the first year, sixteen the second year, fourteen the third year, and fourteen the fourth year. These figures are in striking contrast to the variety of occupations entered by boys, represented by from thirty to forty kinds of work each year.

Factory work and sewing are the two great occupations for girls during the first three years. They include 73 per cent of the girls the first year, 74 per cent the second year, and 65 per cent the third year. During the fourth year, office work steps into second place and leaves sewing in the third position, but even so factory work and sewing comprise 64 per cent of the entire group. Factory work remains very constant from year to year. It employs 52 or 53 per cent of the girls each year. Sewing decreases from 22 and 23 per cent during the first two years to 12 and 11 per cent the third and fourth years. Office work increases in importance from year to year. It occupies fifth place during the first two years, third place in the third year, and second place in the fourth year. In terms of proportion it increases from 3 per cent the first year to 5 per cent the second year, 10 per cent the third year, and 15 per cent the fourth year. The three occupations together comprise from 75 to 79 per cent of the girls each year. "Inside errands" is a beginner's occupation which takes 11 per cent of the girls the first year and 5 per cent the second, but becomes negligible by the third year. "Saleswoman" increases from 2 per cent the first year to 9 per cent the fourth year. Housework is represented each year by small numbers—from 2 to 4 per cent. Millinery, art painting, telephone and telegraph, and printing appear only in the third and fourth year.

TABLE 595

KINDS OF WORK DONE

Girls

First Year			Second Year		
Kind of Work	No. of Cases	Per Cent	Kind of Work	No. of Cases	Per Cent
1. Factory	292	51.7	1. Factory	215	51.6
2. Sewing	122	21.6	2. Sewing	95	22.8
3. Inside errands	60	10.6	3. Inside errands	20	4.8
4. Wrapper	22	3.4	4. Saleswoman	19	4.6
5. Office.	15	2.7	5. Office	19	4.6
6. Saleswoman	13	2.3	6. Wrapper	18	4.3
7. Housework	10	1.8	7. Housework	16	3.8
8. Millinery	7	1.2	8. Miscellaneous	15	3.6
9. Outside errands . . .	6	1.1			
10. Miscellaneous	12	2.1			
Total	559	99.9	Total	417	100.1

Third Year			Fourth Year		
Kind of Work	No. of Cases	Per Cent	Kind of Work	No. of Cases	Per Cent
1. Factory	128	53.1	1. Factory	100	52.8
2. Sewing	28	11.8	2. Office	28	14.8
3. Office.	23	9.6	3. Sewing	21	11.1
4. Saleswoman	21	8.7	4. Saleswoman	16	8.7
5. Printing	8	3.3	5. Housework	6	3.2
6. Wrapper	7	2.9	6. Telephone & telegraph	5	2.6
7. Housework	6	2.5	7. Art painting	2	1.1
8. Inside errands	4	1.7	8. Inside errands	2	1.1
9. Millinery	4	1.7	9. Millinery	2	1.1
10. Art painting	3	1.2	10. Printing	2	1.1
11. Telephone and telegraph	3	1.3	11. Wrapper.	2	1.1
12. Miscellaneous	4	1.7	12. Miscellaneous . . .	3	1.5
Total	239	99.6	Total	189	100.4

TABLE 596

KINDS OF WORK DONE — BY SCHOOL GRADE COMPLETED

Girls

FIRST YEAR

KIND OF WORK	GRADE V		GRADE VI		GRADE VII		GRADE VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1. Factory	80	59.2	111	62.7	71	44.0	30	34.8
2. Sewing	34	25.7	28	15.6	39	24.2	21	24.4
3. Inside errands	10	7.4	15	8.4	21	13.0	14	16.2
4. Wrapper	0	.0	4	2.2	9	5.6	9	10.4
5. Office	0	.0	3	1.9	5	3.1	7	8.1
6. Saleswoman	2	1.5	5	2.8	5	3.1	1	1.2
7. Housework	5	3.7	2	1.1	3	1.9	0	.0
8. Millinery	0	.0	2	1.1	4	2.5	1	1.2
9. Outside errands	1	.7	4	2.2	0	.0	1	1.2
10. Sample pasting	2	1.5	1	.6	2	1.3	0	.0
11. Waitress	0	.0	1	.6	1	.6	0	.0
12. Art painting	0	.0	0	.0	0	.0	1	1.2
13. Hair store	0	.0	0	.0	0	.0	1	1.2
14. Laundry	1	.7	0	.0	0	.0	0	.0
15. Photographer's assistant	0	.0	0	.0	1	.6	0	.0
16. Printing	0	.0	1	.6	0	.0	0	.0
Total	135	100.4	177	99.8	161	99.9	86	99.9

SECOND YEAR

KIND OF WORK	GRADE V		GRADE VI		GRADE VII		GRADE VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1. Factory	56	55.4	80	68.0	53	44.5	26	33.0
2. Sewing	22	21.8	23	19.5	35	29.4	15	19.1
3. Inside errands	3	3.0	3	2.5	5	4.2	9	11.4
4. Saleswoman	3	3.0	6	5.1	7	5.9	3	3.8
5. Office	1	1.0	1	.9	4	3.4	13	16.5
6. Wrapper	2	2.0	2	1.7	7	5.9	7	8.9
7. Housework	10	9.9	2	1.7	4	3.4	0	.0
8. Millinery	1	1.0	0	.0	2	1.6	1	1.3
9. Art painting	0	.0	0	.0	0	.0	2	2.5
10. Telegraph learner	0	.0	1	.9	0	.0	1	1.3
11. Waitress	1	1.0	0	.0	1	.9	0	.0
12. Hair store	0	.0	0	.0	0	.0	1	1.3
13. Laundry	1	1.0	0	.0	0	.0	0	.0
14. Outside errands	1	1.0	0	.0	0	.0	0	.0
15. Sample pasting	0	.0	0	.0	1	.9	0	.0
16. Telephone girl	0	.0	0	.0	0	.0	1	1.3
Total	101	100.1	118	100.3	119	100.1	79	100.4

TABLE 596—*Continued*

Girls

THIRD YEAR

KIND OF WORK	GRADE V		GRADE VI		GRADE VII		GRADE VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1. Factory	25	55.5	41	58.6	48	59.3	14	32.6
2. Sewing	7	15.5	9	12.8	8	9.9	4	9.3
3. Office	2	4.4	5	7.2	5	6.2	11	25.6
4. Saleswoman	3	6.7	5	7.2	8	9.9	5	11.6
5. Printing	3	6.7	2	3.0	3	3.8	0	.0
6. Wrapper	1	2.2	1	1.4	2	2.3	3	7.0
7. Housework	1	2.2	2	3.0	2	2.3	1	2.3
8. Inside errands	1	2.2	1	1.4	2	2.3	0	.0
9. Millinery	1	2.2	1	1.4	1	1.2	1	2.3
10. Art painting	0	.0	0	.0	0	.0	3	7.0
11. Telegraph and telephone	0	.0	2	3.0	1	1.2	0	.0
12. Waitress	0	.0	1	1.4	1	1.2	0	.0
13. Public library clerk	0	.0	0	.0	0	.0	1	2.3
14. Singer in theater	1	2.2	0	.0	0	.0	0	.0
Total	45	99.8	70	100.4	81	99.6	43	100.0

FOURTH YEAR

KIND OF WORK	GRADE V		GRADE VI		GRADE VII		GRADE VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1. Factory	23	71.9	28	53.8	38	53.5	11	32.4
2. Office	1	3.1	7	13.5	9	12.7	11	32.4
3. Sewing	3	9.3	8	15.4	6	8.4	4	11.7
4. Saleswoman	2	6.2	4	7.7	9	12.7	1	2.9
5. Housework	2	6.2	3	5.7	1	1.4	0	.0
6. Telephone and telegraph	0	.0	1	.9	2	2.8	2	5.8
7. Art painting	0	.0	0	.0	0	.0	2	5.8
8. Inside errands	0	.0	0	.0	2	2.8	0	.0
9. Millinery	1	3.1	1	1.9	0	.0	0	.0
10. Printing	0	.0	0	.0	2	2.8	0	.0
11. Wrapper	0	.0	0	.0	1	1.4	1	2.9
12. Laundry	0	.0	0	.0	0	.0	1	2.9
13. Public library clerk	0	.0	0	.0	0	.0	1	2.9
14. Waitress	0	.0	0	.0	1	1.4	0	.0
Total	32	99.8	52	99.9	71	99.9	34	99.7

The relation of school grade completed to kinds of work done is represented for girls in Table 596. Factory work, which includes a little over half of the girls each year, shows a relation to school grade every year. The eighth grade has the smallest proportion of factory workers each year. From 33 to 35 per cent of the eighth-grade girls work in factories, while from 55 to 72 per cent of the fifth-grade girls are so employed. The two intermediate grades vary irregularly between these limits. Sewing, the next largest occupation, shows no consistent relation to school grade. Office work shows a clear relation to school grade each year. Table 597 presents the facts for office work in convenient summary. For the fifth-grade girls the proportion of office work increases from none in the first year to 3 per cent in the fourth; while for eighth-grade girls it increases from 8 per cent in the first year to 32 per cent in the fourth year. None of the other occupations contain a sufficient number of cases to form a basis of conclusion with regard to their relation to school grade.

TABLE 597

PER CENT OF GIRLS EMPLOYED IN OFFICE WORK – BY SCHOOL GRADE

	Grade V	Grade VI	Grade VII	Grade VIII
First year	0	2	3	8
Second year . . .	1	1	3	17
Third year . . .	4	7	6	26
Fourth year . . .	3	14	13	32

KIND OF INDUSTRY ENTERED

The classification of the last section was by kind of work done. Errand boys, office workers, and sewing girls are employed by different kinds of industries. Most industries employ errand boys and office boys and girls. In the last section whether the office work was performed for store, factory, or commercial house, it was all listed as office work. Any girl employed in sewing, whether it was for a dressmaker, a tailoring shop, or a department store, was listed under sewing. In this section the industry is made the basis of classification. All children employed by a shoe factory, whether for errands, office work, or in the factory operations, are listed as employees of shoe factories.

The summary of the facts about industries entered by boys during the first four years is given in Table 598. In these tables the industries employing 1 per cent or less of the total number of boys are listed under miscellaneous.

The analysis of this miscellaneous group is contained in Table 599 in which the complete list of industries for each year, with the number of children employed by each, is given in detail. The main facts are as follows: During the first year, 826 positions are recorded. One-fourth of these belong in the miscellaneous group, three-fourths are distributed among 18 industries. The total number of industries was 108. Accordingly, one-fourth of the positions were distributed among 90 industries. During the second year the number of positions recorded is 743. Of these 29 per cent belong in the miscellaneous class, and 71 per cent are distributed among 22 industries. The total number of industries is 122. Accordingly 29 per cent of the positions are distributed among 100 industries. For the third year, 542 positions are recorded. Thirty-nine per cent of them belong in the miscellaneous class, and 61 per cent are distributed among 20 industries. There were 128 industries in the complete list. Accordingly, 29

TABLE 598

KIND OF INDUSTRY ENTERED

Boys

First Year			Second Year		
Kind of Industry	No. of Cases	Per Cent	Kind of Industry	No. of Cases	Per Cent
1. Shoe factory	135	16.3	1. Shoe factory	107	14.4
2. Department store	103	12.5	2. Department store	66	8.9
3. Telegraph company	80	9.7	3. Printing	55	7.4
4. Printing	71	8.6	4. Metal trades	44	5.9
5. Metal trades	52	6.1	5. Telegraph company	40	5.4
6. Tailor shop	33	4.0	6. Machine tool	38	5.0
7. Machine tool	17	2.1	7. Tailor shop	24	3.2
8. Grocery	17	2.1	8. Grocery	22	3.0
9. Millinery	16	1.9	9. Carriage factory	12	1.6
10. Express company	14	1.7	10. Express company	11	1.5
11. Drug store	12	1.4	11. Jewelry	11	1.5
12. Furniture factory	12	1.4	12. Electric supply co.	10	1.3
13. Electric supply co.	11	1.3	13. Millinery	10	1.3
14. Carriage factory	11	1.3	14. Bakery	10	1.3
15. Office work (in private professional offices)	10	1.2	15. Florist	9	1.2
16. Jewelry	9	1.1	16. Furniture factory	9	1.2
17. Stationery	9	1.1	17. Glass & bottle factory	9	1.2
18. Florist	9	1.1	18. Office work (in private professional offices)	9	1.2
Miscellaneous	206	24.9	19. Confectioners' (candy store)	8	1.1
			20. Lamp company	8	1.1
			21. Paper company	8	1.1
			22. Railroad employee	8	1.1
			Miscellaneous	215	29.0
Total	827	99.8	Total	743	99.9

TABLE 598—*Continued*

Boys

Third Year			Fourth Year		
Kind of Industry	No. of Cases	Per Cent	Kind of Industry	No. of Cases	Per Cent
1. Shoe factory	61	11.2	1. Shoe factory	38	9.7
2. Printing	47	8.7	2. Printing	37	9.5
3. Machine shop	45	8.3	3. Tool works	18	4.6
4. Department store	24	4.3	4. Machine shop	17	4.3
5. Metal trades	22	4.1	5. Department store	12	3.1
6. Telegraph company	15	2.8	6. Electric company	11	2.8
7. Railroad company	14	2.6	7. Telegraph company	10	2.5
8. Tailoring	10	1.8	8. Furniture factory	8	2.0
9. Jewelry mfg.	10	1.8	9. Railroad company	8	2.0
10. Lamp mfg.	9	1.7	10. Plumbing	8	2.0
11. Brewery	9	1.7	11. Tailoring	7	1.8
12. Electric company	9	1.7	12. Brewery	6	1.5
13. Carriage company	8	1.4	13. Grocery	6	1.5
14. Express company	8	1.4	14. Abattoir	5	1.3
15. Furniture factory	7	1.3	15. Candy factory	5	1.3
16. Grocery	7	1.3	16. Bakery	4	1.0
17. Butcher shop	6	1.1	17. Carriage factory	4	1.0
18. Candy factory	6	1.1	18. Saddlery	4	1.0
19. Laundry	6	1.1	Miscellaneous	183	46.8
20. Saddlery	6	1.1			
Miscellaneous	213	39.3			
Total	542	99.8	Total	391	99.7

per cent of the positions were distributed among 108 industries. For the fourth year, 385 positions are recorded. Of these 47 per cent belong in the miscellaneous group, and 53 per cent are distributed among 18 industries. The total number of industries is 143. Accordingly, 47 per cent of the boys are distributed among 125 industries.

The facts can be summed up as follows: The number of positions represented becomes less each year, because the number of boys is smaller and the changes of position fewer from year to year. The number of industries employing more than 1 per cent of the boys remains fairly constant from year to year. It varies from 18 to 22. The number of kinds of industries employing boys increases from year to year from 108 to 143, in spite of the fact that both the number of boys and the number of changes of position become less. The proportion of boys employed by the group of industries which takes more than 1 per cent decreases from 75 per cent the first year to 53 per cent the fourth, while the number distributed among the miscellaneous industries increases proportionately from 25 per cent the first year to 47 per cent the fourth year. The figures

TABLE 599

KIND OF INDUSTRY ENTERED: FIRST YEAR OF EMPLOYMENT

Complete List

Boys

1. Shoe factory	135
2. Department store	103
3. Messenger service	80
4. Printing trade	71
5. Metal trades	52
6. Tailoring	33
7. Grocery	17
8. Machine tool	17
9. Millinery	16
10. Express company	14
11. Drug store	12
12. Furniture factory	12
13. Carriage factory	11
14. Electrical supplies	11
15. Office work (private)	10
16. Florist	9
17. Jewelry	9
18. Stationery	9
19. Hardware company	8
20. Newspaper company	8
21. Dental and surgical supplies	7
22. Paint dealer	7
23. Art store	6
24. Bakery	6
25. Dyeing and cleaning	6
26. Restaurant	6
27. Cigar dealer	5
28. Glass and bottle factory	5
29. Paper company	5
30. Theater usher	5
31. Butcher shop	4
32. Cigar factory	4
33. Lamp company	4
34. Optical company	4
35. Paper hanger	4
36. Plumbers' supplies	4
37. Brewery and distillery	3
38. Fancy goods	3
39. Glass ware	3
40. Huckster	3
41. Ice delivery	3
42. Laundry supply company	3
43. Soap company	3
44. Railroad	3
45. Wooden box company	3
46. Billiard manufactory	2
47. Book store	2
48. Candy store	2
49. Coffin company	2
50. Furniture store	2
51. House work	2
52. Jewelry engraving	2
53. Kindling company	2
54. Leather belt factory	2
55. Leather store	2
56. Life insurance	2
57. Mercantile agency	2
58. Paper box factory	2
59. Plumbing	2
60. Rug manufactory	2
61. Textile company	2
62. Woolen company	2
63. Abattoir	1
64. Agricultural chemist	1
65. Bank messenger	1
66. Base ball manufacturing co.	1
67. Brush factory	1
68. Cabinet making	1
69. Car company	1
70. Coal company	1
71. Cooperage	1
72. Corticelli silk company	1
73. Cotton mill	1
74. Cotton oil company	1
75. Dress trimming company	1
76. Drug supply company	1
77. Engineering company	1
78. Fireworks company	1
79. Furrier	1
80. Hotel bell boy	1
81. Ink and shoe polish	1
82. Kite company	1
83. Lock and safe company	1
84. Lumber company	1
*85. Mercantile agency	1
86. Metal polish company	1
87. Milk supply depot	1
88. Mop factory	1
89. Motor car company	1
90. Music store	1
91. Notions wholesale	1
92. Packing company	1
93. Piano company	1
94. Pickle factory	1
95. Rags and old iron	1
96. Real estate company	1
97. Railroad supply company	1
98. Roofing company	1
99. Rubber stamp company	1
100. Rubber store	1
101. Saddlery company	1
102. Steamship company	1
103. Stove company	1
104. Traction company	1
105. Traveling companion	1
106. Umbrella factory	1
107. Undertaker	1
108. Wholesale clothing	1
Total	826

TABLE 599—*Continued*

KIND OF INDUSTRY ENTERED: SECOND YEAR OF EMPLOYMENT

Complete List

Boys

1.	Shoe factory	107
2.	Department store	66
3.	Printing trade	55
4.	Metal trade	44
5.	Messenger service	40
6.	Machine tool	38
7.	Tailoring	24
8.	Grocery	22
9.	Carriage factory	12
10.	Express company	11
11.	Jewelry	11
12.	Bakery	10
13.	Electric supply company	10
14.	Millinery	10
15.	Florist	9
16.	Furniture factory	9
17.	Glass and bottle factory	9
18.	Office work (private)	9
19.	Confectioner	8
20.	Lamp company	8
21.	Paper company	8
22.	Railroad	8
23.	Butcher shop	7
24.	Dental and surgical supplies	7
25.	Plumbing	7
26.	Soap company	7
27.	Stationer	7
28.	Brewery and distillery	6
29.	Newspaper company	6
30.	Plumber supplies company	6
31.	Hardware company	5
32.	Music store	5
33.	Paper hanger	5
34.	Laundry	4
35.	Laundry supply company	4
36.	Saddlery company	4
37.	Advertising company	3
38.	Art store	3
39.	Cigar dealer	3
40.	Coffin company	3
41.	Dyeing and cleaning	3
42.	Novelty company	3
43.	Optician	3
44.	Paint dealer	3
45.	Piano factory	3
46.	Rubber stamp company	3
47.	Stove factory	3
48.	Traction company	3
49.	Wooden box company	3
50.	Woolen company	3
51.	Assistant cook	2
52.	Car company	2
53.	Carpet house	2
54.	Cigar factory	2
55.	Cooperage	2
56.	Drug store	2
57.	Farmer	2
58.	Glass ware	2
59.	Huckster	2
60.	Ice dealer	2
61.	Jewelry engraving	2
62.	Leather company	2
63.	Life insurance	2
64.	Motor car company	2
65.	Playing card company	2
66.	Pure food company	2
67.	Railroad supply company	2
68.	Theater usher	2
69.	Umbrella factory	2
70.	Wholesale clothing	2
71.	Wholesale dry goods	2
72.	Auto supply company	1
73.	Baseball mfg. company	1
74.	Billboard company	1
75.	Camera company	1
76.	Carpenter	1
77.	Cement company	1
78.	Chemical company	1
79.	Cleaning and scrubbing company	1
80.	Coal company	1
81.	Cook for railroad company	1
82.	Cook for steamship company	1
83.	Corticelli silk company	1
84.	Cotton mill	1
85.	Dress trimming company	1
86.	Drug supply company	1
87.	Engineer supply company	1
88.	Fancy goods company	1
89.	Fertilizer company	1
90.	Film company	1
91.	Fire works company	1
92.	Fishery company	1
93.	Fountain pen company	1
94.	Furrier	1
95.	Gas car association	1
96.	Golf club caddy	1
97.	Grinder company	1
98.	Handkerchief company	1
99.	House wrecker	1
100.	Kindling company	1
101.	Lumber company	1
102.	Mercantile agency	1
103.	Mill company	1
104.	Optical supplies	1
105.	Paper box factory	1
106.	Pawn shop	1
107.	Pickle factory	1
108.	Pottery company	1
109.	Progressive supply company	1

TABLE 599—*Continued*

Boys

110. Real estate company	1
111. Rubber company	1
112. Saloon	1
113. Sinton hotel boy	1
114. Steam ship company	1
115. Stocking factory	1
116. Surveyor's office	1
117. Tannery	1
118. Traveling companion	1
119. Typewriter ribbon mfg. co.	1
120. Union savings bank	1
121. Wooden ware company	1
122. Wood turning	1
Total	743

KIND OF INDUSTRY ENTERED: THIRD YEAR OF EMPLOYMENT

Complete List

Boys

1. Shoe factory	61
2. Printing trade	47
3. Machine shops	45
4. Department store	24
5. Metal trades	22
6. Telegraph company	15
7. Railroad company	14
8. Clothing mfg. company	10
9. Jewelry mfg. company	10
10. Lamp mfg. company	9
11. Brewery	9
12. Electric company	9
13. Carriage company	8
14. Express company	8
15. Furniture factory	7
16. Grocery	7
17. Butcher shop	6
18. Candy factory	6
19. Laundry	6
20. Saddlery	6
21. Bakery	5
22. Office supplies	5
23. Paper factory	5
24. Piano factory	5
25. Tailoring establishment	5
26. Auto repair	4
27. Drug—retail	4
28. Hardware company	4
29. Millinery—wholesale	4
30. Peddler	4
31. Selling papers	4
32. Soap factory	4
33. Abattoir	3
34. Bottle manufacturing	3
35. Box factory	3
36. Can mfg. company	3
37. Coffin company	3
38. Dry goods—wholesale	3
39. Florist—retail	3
40. Ice—delivery	3
41. Lumber company	3
42. Music company	3
43. Optician	3
44. Plumbing and gas	3
45. Rubber company	3
46. Shirt company	3
47. Tinner	3
48. Theater	3
49. Traction company	3
50. Watch case company	3
51. Woolen mills	3
52. Book binding	2
53. Candy—retail	2
54. Cigar—retail	2
55. Chemical company	2
56. Electrical company	2
57. Envelope company	2
58. Farm work	2
59. Life insurance	2
60. Men's furnishing store	2
61. Overall company	2
62. Packing company	2
63. Pawn shop	2
64. Playing card company	2
65. Plumbers' supplies	2
66. Restaurant	2
67. Paint and varnish company	2
68. Sporting goods	2
69. Stationery company	2
70. Tailors' trimming	2
71. Undertakers' supplies	2
72. Art publishers	1
73. Auto manufacturing	1
74. Bank	1
75. Barber shop	1
76. Benzol company	1
77. Boiler works	1
78. Brokers	1
79. Bung manufacturing	1
80. Business men's club	1
81. Button factory	1
82. Carpet company	1

TABLE 599—*Continued*

Boys

83. Carpet cleaning	1
84. Carpenter	1
85. Cement	1
86. Cigar factory	1
87. Cigar cutter	1
88. Chauffeur	1
89. Dairy company	1
90. Dental supplies	1
91. Drugs—wholesale	1
92. Fells fund	1
93. Fence company	1
94. Fish market	1
95. Fire works	1
96. Five and ten cent store	1
97. Florist	1
98. Fountain pen	1
99. Gas consumers company	1
100. Glass and china	1
101. Horse shoeing	1
102. Hotel page	1
103. Ladies' store	1
104. Last company	1
105. Leather	1
106. Marble works	1
107. Meat packing	1
108. Millinery—retail	1
109. Navy	1
110. Notion store	1
111. Novelty manufacturing	1
112. Paper goods	1
113. Preserving factory	1
114. Pickle company	1
115. Pipe organ factory	1
116. Private residence	1
117. Race track	1
118. River work	1
119. Rubber stamp	1
120. Rookwood pottery	1
121. Real estate	1
122. Rug company	1
123. Saloon	1
124. Selling tickets	1
125. Silver ware factory	1
126. Spray company	1
127. Shade company	1
128. Shoe store	1
129. Truss company	1
130. Underwear factory	1
131. Water motor	1
132. Wirebound box company	1
133. Wire cloth company	1
134. Wooden ware company	1
Total	542

KIND OF INDUSTRY ENTERED: FOURTH YEAR OF EMPLOYMENT

COMPLETE LIST

Boys

1. Shoe factory	38
2. Printing trade	37
3. Tool works	18
4. Machine shop	17
5. Department store	12
6. Electric company	11
7. Telegraph company	10
8. Furniture factory	8
9. Railroad company	8
10. Plumbing	8
11. Tailoring	7
12. Brewery	6
13. Grocery	6
14. Abattoir	5
15. Candy factory	5
16. Bakery	4
17. Carriage factory	4
18. Saddlery	4
19. Amusement company	3
20. Auto factory	3
21. Brass foundry	3
22. Chauffeur	3
23. Clothing factory	3
24. Florist	3
25. Jewelry manufactory	3
26. Lamp manufactory	3
27. Office supply company	3
28. Paper factory	3
29. Peddling	3
30. Piano company	3
31. Selling papers	3
32. Tinning	3
33. Valve company	3
34. Art company	2
35. Candle factory	2
36. Canning factory	2
37. Chocolate factory	2
38. Coffin factory	2
39. Contracting	2
40. Cooking	2
41. Drug—retail	2
42. Drug—wholesale	2

TABLE 599—*Continued*

Boys

43. Farming	2
44. Glass company	2
45. Harness company	2
46. Ice delivery	2
47. Insurance	2
48. Iron work	2
49. Laundry	2
50. Music company	2
51. Musical instrument company	2
52. Optical company	2
53. Playing card company	2
54. Rubber company	2
55. Sash and door company	2
56. Shoe repair	2
57. Soap company	2
58. Traction company	2
59. Wholesale jewelers	2
60. Woolen mills	2
61. Architect	1
62. Asbestos pipe company	1
63. Auto lamp company	1
64. Auto repair company	1
65. Banking	1
66. Boiler works	1
67. Box factory	1
68. Bowling alley	1
69. Butchers' supply company	1
70. Candy store	1
71. Can company	1
72. Car company	1
73. Carpet company	1
74. Casting company	1
75. Chemical company	1
76. Cigar factory	1
77. Cigar—wholesale	1
78. City labor	1
79. Cleaning windows	1
80. Cloak company	1
81. Dairy	1
82. Dental supplies	1
83. Dry goods—wholesale	1
84. Engineer	1
85. Engraving	1
86. Expressing	1
87. Fence company	1
88. Film	1
89. Fountain pen	1
90. Gardener	1
91. Gas and electric company	1
92. Gas consumers association	1
93. Hardware—retail	1
94. Hat company	1
95. Hay and grain company	1
96. House painting	1
97. Ice cream company	1
98. Ink company	1
99. Jewelry, retail	1
100. Laundry supplies	1
101. Leather products company	1
102. Lock smith	1
103. Lumber company	1
104. Marble company	1
105. Meat market	1
106. Men's furnishing	1
107. Millinery—wholesale	1
108. Nickel plating	1
109. Novelty manufactory	1
110. Novelty—retail	1
111. Oil company	1
112. Paint and varnish company	1
113. Paper box company	1
114. Paper hanger	1
115. Pawn shop	1
116. Pickle company	1
117. Plaster company	1
118. Plating mill	1
119. Pool room	1
120. Power washer	1
121. Preserving company	1
122. Pulley company	1
123. Real estate	1
124. Restaurant	1
125. Rug company	1
126. Sanitary ware	1
127. Scientific apparatus	1
128. Screen company	1
129. Shirt company	1
130. Sign painting	1
131. Spray company	1
132. Sporting goods	1
133. Stencil company	1
134. Stove company	1
135. Stamping company	1
136. Table company	1
137. Tailors' trimmings	1
138. Tannery	1
139. Ten cent store	1
140. Trust company	1
141. Type foundry	1
142. Wagon manufactory	1
143. Waterproof paper company	1
144. Watch case factory	1
145. Wooden ware company	1
Total	392

give a picture of the rate at which boys entering industry become distributed through greater numbers of industries during the first four years.

The number of boys employed by any one industry is so small as to make it difficult to base conclusions upon any one industry. Shoe factories constituted the leading industry for boys throughout the four years. The proportion employed by shoe factories decreases from 16 per cent the first year to 10 per cent the fourth year. Department stores and printing come next in importance. Department stores are second on the list during the first two years, but fourth and fifth in the third and fourth years. Shoe factories and department stores are the only industries which at any time employ more than 10 per cent of the boys. Printing is fourth and third on the list the first two years, and second in the third and fourth years. Metal trades, including the machine tool and machine shop plants, stand from fifth to third place. The telegraph company stands from third to seventh place in successive years. Tailoring decreases in importance from sixth place to eleventh. Electric companies rise from thirteenth to

TABLE 600

KINDS OF INDUSTRY ENTERED — BY SCHOOL GRADE COMPLETED

Boys

First Year

Kind of Industry	Grade V		Grade VI		Grade VII		Grade VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1. Shoe factory	59	21.8	43	16.9	27	13.9	6	5.6
2. Department store	21	7.8	29	11.4	27	13.9	26	24.1
3. Telegraph company	34	12.6	26	10.2	15	7.7	5	4.6
4. Printing	20	7.4	22	8.7	18	9.3	11	10.2
5. Metal trades	10	3.7	22	8.7	13	6.7	7	6.4
6. Tailoring	14	5.2	4	1.6	8	4.1	7	6.4
7. Machine tool	2	.7	7	2.8	2	1.1	6	5.6
8. Grocery	8	3.0	4	1.6	3	1.5	2	1.8
9. Millinery	5	1.9	3	1.2	6	3.0	2	1.8
10. Express company	2	.7	5	2.0	4	2.1	3	2.8
11. Drug store	2	.7	6	2.4	4	2.1	0	.0
12. Furniture factory	4	1.5	6	2.4	1	.5	1	.9
13. Electric supply company	2	.7	5	2.0	3	1.5	1	.9
14. Carriage factory	2	.7	2	.8	7	3.6	0	.0
15. Office work	2	.7	1	.4	3	1.5	4	3.7
16. Jewelry	4	1.5	1	.4	3	1.5	1	.9
17. Stationery	1	.4	4	1.6	3	1.5	1	.9
18. Florist	2	.7	0	.0	5	2.6	2	1.8
Miscellaneous	77	28.5	64	25.2	42	21.6	23	21.3
Total	271	100.2	254	100.3	194	99.7	108	99.7

TABLE 600—*Continued*

SECOND YEAR

KIND OF INDUSTRY	GRADE V		GRADE VI		GRADE VII		GRADE VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1. Shoe factory	38	15.8	36	16.3	25	15.0	8	6.8
2. Department store	14	5.9	21	9.5	15	9.0	16	13.7
3. Printing	12	5.1	21	9.5	10	6.0	12	10.3
4. Metal trade	11	4.6	13	5.9	12	7.2	8	6.8
5. Telegraph company . . .	19	8.0	9	4.1	9	5.4	3	2.6
6. Machine tool	12	5.0	16	7.3	6	3.6	4	3.4
7. Tailor shop	11	4.6	4	1.9	4	2.4	5	4.2
8. Grocery	9	3.8	6	2.7	4	2.4	3	2.6
9. Carriage factory	2	.8	5	2.3	3	1.8	2	1.7
10. Express company	1	.4	5	2.3	2	1.2	3	2.6
11. Jewelry	3	1.2	0	.0	5	3.0	3	2.6
12. Electric supply company .	2	.8	2	.9	4	2.4	2	1.7
13. Millinery	1	.4	3	1.4	4	2.4	2	1.7
14. Bakery	4	1.7	2	.9	4	2.4	0	.0
15. Florist	3	1.2	2	.9	3	1.8	1	.9
16. Furniture factory	6	2.5	2	.9	0	.0	1	.9
17. Glass and bottle factory .	5	2.1	1	.5	2	1.2	1	.9
18. Office work	1	.4	0	.0	5	3.0	3	2.7
19. Confectioner	3	1.2	5	2.3	0	.0	0	.0
20. Lamp company	5	2.1	1	.5	2	1.2	0	.0
21. Paper company	3	1.2	4	1.9	0	.0	1	.9
22. Railroad employee . . .	2	.8	3	1.4	2	1.2	1	.9
Miscellaneous	73	30.4	59	26.8	45	27.1	38	32.5
Total	240	100.0	220	100.2	166	100.2	117	99.8

sixth place. The list of industries employing 1 per cent or more each year for four years is as follows:

Shoe factories
Department stores
Printing
Metal trades (including machine tool and machine shop)
Tailoring
Telegraph companies
Grocery stores
Furniture factories
Electric companies
Carriage factories

The kind of industry entered, in relation to the school grade completed, is presented in Table 600. There is very little information to be derived from these tables—which is not surprising since each industry represents a large variety of types of work. There are a few points of interest.

TABLE 600—*Continued*

THIRD YEAR

KIND OF INDUSTRY	GRADE V		GRADE VI		GRADE VII		GRADE VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1. Shoe factory	16	9.2	23	15.3	18	14.4	4	4.3
2. Printing	11	6.4	15	10.0	11	8.8	10	10.7
3. Machine shop	16	9.2	17	11.3	8	6.4	4	4.3
4. Department store	6	3.5	5	3.3	7	5.6	6	6.4
5. Metal trades	7	4.1	5	3.3	6	4.8	4	4.3
6. Telegraph company . . .	6	3.5	4	2.7	3	2.4	2	2.1
7. Railroad company . . .	2	1.2	6	4.0	5	4.0	1	1.2
8. Clothing company . . .	5	2.9	0	.0	3	2.4	2	2.1
9. Jewelry manufacturing .	1	.6	0	.0	6	4.8	3	3.2
10. Lamp manufacturing . .	4	2.3	3	2.0	0	.0	2	2.1
11. Brewery	6	3.5	3	2.0	0	.0	0	.0
12. Electric company	3	1.8	3	2.0	2	1.6	1	1.2
13. Carriage company . . .	2	1.2	3	2.0	0	.0	3	3.2
14. Express company	2	1.2	2	1.3	3	2.4	1	1.2
15. Grocery	5	2.9	0	.0	1	.8	1	1.2
16. Furniture factory	5	2.9	1	.7	1	.8	0	.0
17. Butcher shop	3	1.8	3	2.0	0	.0	0	.0
18. Candy factory	3	1.8	1	.7	1	.8	1	1.2
19. Laundry	2	1.2	1	.7	2	1.6	1	1.2
20. Saddlery	3	1.8	2	1.3	0	.0	1	1.2
Miscellaneous	65	38.0	53	35.3	48	38.4	47	50.0
Total	173	100.2	150	99.9	125	100.0	94	100.1

FOURTH YEAR

KIND OF INDUSTRY	GRADE V		GRADE VI		GRADE VII		GRADE VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1. Shoe factory	7	5.7	14	13.1	13	13.2	4	7.3
2. Printing	5	4.1	17	14.9	10	10.0	5	9.1
3. Tool works	8	6.5	5	4.4	3	3.0	2	3.6
4. Machine shop	8	6.5	2	1.8	5	5.0	2	3.6
5. Department store	1	.8	4	3.6	4	4.0	3	5.4
6. Electric company	3	2.4	4	3.6	3	3.0	1	1.8
7. Telegraph company . . .	4	3.2	2	1.8	4	4.0	0	.0
8. Furniture factory	5	4.1	1	.9	1	1.0	1	1.8
9. Railroad company . . .	2	1.6	2	1.8	3	3.0	1	1.8
10. Plumbing	3	2.4	3	2.7	1	1.0	1	1.8
11. Tailoring	3	2.4	1	.9	2	2.2	1	1.8
12. Brewery	4	3.2	1	.9	1	1.0	0	.0
13. Grocery	3	2.4	2	1.8	1	1.0	0	.0
14. Abattoir	2	1.6	0	.0	1	1.0	2	3.6
15. Candy factory	2	1.6	0	.0	2	2.2	1	1.8
16. Bakery	2	1.6	0	.0	2	2.2	0	.0
17. Carriage factory	1	.8	2	1.8	1	1.0	0	.0
18. Saddlery	2	1.6	1	.9	0	.0	1	1.8
Miscellaneous	58	47.2	53	46.5	42	42.4	31	54.5
Total	123	99.7	114	100.3	99	100.2	56	99.7

Comparatively few eighth-grade boys go into shoe factories in any year. During the first two years, the three lower grades are all generously represented. During the third and fourth year, fifth-grade boys tend to disappear from the shoe factories but the sixth- and seventh-grade groups remain large. The inference seems to be that boys of the sixth- and seventh-grade groups have a good chance to remain in shoe factories and make good at the somewhat more skilled jobs that are assigned to boys by their third or fourth year. Fifth-grade boys, who are tried on the simple and routine tasks of the first two years, are not so able to make good and stay in the trade. The eighth-grade boys do not enter the trade at all in large numbers. The printing trade shows little relation to school grade except that the number of fifth-grade boys is smaller than that of the other grades every year. Apparently the boy with a sixth-grade equipment can meet the present requirements of the trade.

The eighth-grade boys show an interesting tendency to be the most widely distributed group. Every year the proportion of the eighth-grade group classified as miscellaneous is larger than that of any other grade. It seems fair to conclude that the variety of positions open to boys who have completed eighth grade is greater than it is for those who have completed some grade less than the eighth.

The summary of the facts about industries entered by girls is given in Table 601. The miscellaneous group includes the industries in which not more than 1 per cent of the girls were employed. The analysis of the miscellaneous group is contained in Table 602, which gives a complete list of the industries in which the girls were employed each year, with the number in each industry. During the first year 559 positions are recorded. Thirteen per cent of them belong in the miscellaneous group. The remaining 87 per cent are distributed among 11 industries. The total number of industries is 46. Accordingly, 13 per cent of the positions were distributed among 35 industries. During the second year the total number of positions is 417, of which 14 per cent belong in the miscellaneous group and 86 per cent are distributed among 15 industries. The total number of industries entered by girls during the year was 54. Accordingly, 14 per cent of the positions were distributed among 39 industries. During the third year, 259 positions were recorded of which 36 per cent belong in the miscellaneous group, while 64 per cent are distributed among 12 industries. The total number of industries entered by girls during the year was 69. Accordingly, 36 per cent of the positions were distributed among 57 industries. During the fourth year 205 positions were recorded. Of these 28 per cent are classed as miscellaneous, and 72 per cent are distributed among 16 industries. The number of industries entered by girls during the year was 57. Accordingly, 28 per cent of the positions were distributed among 41 industries.

TABLE 601

KIND OF INDUSTRY ENTERED

Girls

First Year			Second Year		
Kind of Industry	No. of Cases	Per Cent	Kind of Industry	No. of Cases	Per Cent
1. Shoe factory	147	26.4	1. Tailoring	99	23.8
2. Tailoring	133	23.8	2. Shoe factory	93	22.3
3. Department store . . .	78	14.0	3. Department store . .	49	11.8
4. Paper box factory . . .	38	6.8	4. Paper box factory . .	23	5.5
5. Candy factory	30	5.4	5. Domestic service . .	16	3.8
6. Millinery	13	2.3	6. Candy factory	12	2.9
7. Soap company	12	2.2	7. Soap company	11	2.6
8. Domestic service . . .	11	2.0	8. Paper goods company.	9	2.2
9. Paper goods company .	10	1.8	9. Grocery	8	1.9
10. Garter factory	6	1.0	10. Printing and binding .	7	1.7
11. Knitted goods company	6	1.0	11. Knitted goods co. . .	7	1.7
Miscellaneous. . . .	75	13.4	12. Millinery	7	1.7
			13. Feather factory . . .	6	1.4
			14. Garter factory	6	1.4
			15. Art company	5	1.2
			Miscellaneous . . .	59	14.2
Total	559	100.2	Total	417	100.1

Third Year			Fourth Year		
Kind of Industry	No. of Cases	Per Cent	Kind of Industry	No. of Cases	Per Cent
1. Shoe factory	55	21.2	1. Shoe factory	41	20.0
2. Tailoring	26	10.0	2. Department store . .	20	9.8
3. Department store . . .	18	7.0	3. Tailoring	19	9.2
4. Overall factory	14	5.4	4. Overall company . . .	16	7.8
5. Candy factory	8	3.1	5. Candy factory	6	2.9
6. Clothing factory . . .	8	3.1	6. Clothing company . .	6	2.9
7. Grocery	8	3.1	7. Soap company	6	2.9
8. House work	6	2.3	8. House work	5	2.4
9. Soap company	6	2.3	9. Paper box factory . .	5	2.4
10. Shirt factory	6	2.3	10. Flag company	4	2.0
11. Paper box factory . . .	5	1.9	11. Shirt factory	4	2.0
12. Printing	5	1.9	12. Telephone operator . .	4	2.0
Miscellaneous . . .	94	36.3	13. Grocery	3	1.4
			14. Paper goods	3	1.4
			15. Printing	3	1.4
			16. Brewery.	3	1.4
			Miscellaneous . . .	57	28.0
Total	259	99.9	Total	205	99.9

TABLE 602

KIND OF INDUSTRY ENTERED: FIRST YEAR OF EMPLOYMENT

Complete List

Girls

1. Shoe factory	147
2. Tailoring	133
3. Department store	78
4. Paper box factory	38
5. Candy factory	30
6. Millinery	13
7. Soap company	12
8. Domestic service	11
9. Paper goods company	10
10. Garter factory	6
11. Knitted goods company	6
12. Bakery	5
13. Cigar factory	5
14. Grocery	5
15. Printer and binder	5
16. Carriage company	4
17. Feather factory	4
18. Woolen goods	4
19. Yeast factory	4
20. Umbrella factory	3
21. Chewing gum factory	2
22. Fancy work	2
23. Glove factory	2
24. Lamp company	2
25. Laundry	2
26. Paint shop	2
27. Photographer	2
28. Private office	2
29. Restaurant	2
30. Woolen and cotton company	2
31. Art company	1
32. Bed springs and mattress company	1
33. Bottle factory	1
34. Candy store	1
35. Florist	1
36. Glass works	1
37. Hair goods	1
38. Jewelry company	1
39. Playing card company	1
40. Rug factory	1
41. Shoe store	1
42. Sporting goods	1
43. Telegraph company	1
44. Truss company	1
45. Undertakers' supplies	1
46. Wrought iron company	1
Total	559

KIND OF INDUSTRY ENTERED: SECOND YEAR OF EMPLOYMENT

Complete List

Girls

1. Tailoring	99
2. Shoe factory	93
3. Department store	49
4. Paper box factory	23
5. Domestic service	16
6. Candy factory	12
7. Soap company	11
8. Paper goods company	9
9. Grocery	8
10. Printing and binding	7
11. Knitted goods	7
12. Millinery	7
13. Feather factory	6
14. Garter factory	6
15. Art company	5
16. Private office	3
17. Fancy goods company	3
18. Cigar factory	3
19. Chewing gum	3
20. Glove factory	3
21. Laundry	3
22. Telegraph company	3
23. Carriage company	3
24. Glass works	2
25. Life insurance company	2
26. Restaurant	2
27. Yeast factory	2
28. Abattoir	1
29. Bakery	1
30. Bottle factory	1
31. Brewer's supply company	1
32. Broom factory	1
33. Candy store	1
34. Cigar box factory	1
35. Distillery	1
36. Electrical supply company	1
37. Furniture factory	1
38. Glass ware	1

TABLE 602—*Continued*

39. Hay and grain company	1
40. Ice cream cone company	1
41. Hair goods company	1
42. Jewelry store	1
43. Notion store	1
44. Optician	1
45. Piano company	1
46. Playing card company	1
47. Quilting company	1
48. Rookwood pottery	1
49. Rug factory	1
50. Sporting goods	1
51. Truss company	1
52. Umbrella factory	1
53. Undertakers' supply	1
54. Woolen and cotton goods	1
Total	417

KIND OF INDUSTRY ENTERED: THIRD YEAR OF EMPLOYMENT

Complete List

Girls

1. Shoe factory	55
2. Tailoring	26
3. Department store	18
4. Overall factory	14
5. Candy and gum factory	8
6. Clothing manufacturing	8
7. Grocery	8
8. Housework	6
9. Soap company	6
10. Shirt company	6
11. Paper box factory	5
12. Printing and book binding	5
13. Art company	4
14. Cigar factory	4
15. Garter factory	4
16. Paper bag factory	4
17. Underwear factory	4
18. Uniform factory	4
19. Cap factory	3
20. Clothing store	3
21. Five and ten cent store	3
22. Lithographing	3
23. Millinery—wholesale	3
24. Dentist	2
25. Flag manufacturing	2
26. Lace and embroidery	2
27. Leather products company	2
28. Life insurance	2
29. Millinery—retail	2
30. Stationery company	2
31. Abattoir	1
32. Amusement company	1
33. Biscuit company	1
34. Bottle factory	1
35. Coffee and tea company	1
36. Coffin company	1
37. Color card company	1
38. Comfort company	1
39. Cotton goods	1
40. Dressmaking	1
41. Drug—retail	1
42. Dry goods—retail	1
43. Electric company	1
44. Engraving and embossing company	1
45. Feather company	1
46. Feather duster factory	1
47. Fleischmann's yeast	1
48. Glassware company	1
49. Hotel (waitress)	1
50. Iron works	1
51. Letter shop	1
52. Linotyping company	1
53. Mop factory	1
54. Novelty company	1
55. Optician	1
56. Paper company	1
57. Piano company	1
58. Playing card company	1
59. Public library clerk	1
60. Pure food company	1
61. Rug factory	1
62. Sewing machine company	1
63. Shoe store	1
64. Sporting goods company	1
65. Standard pad company	1
66. Telegraph company	1
67. Telephone company	1
68. Truss company	1
69. Umbrella store	1
Total	257

TABLE 602—*Continued*

KIND OF INDUSTRY ENTERED: FOURTH YEAR OF EMPLOYMENT

COMPLETE LIST

Girls

1. Shoe factory	41	30. Playing card company	2
2. Department store	20	31. Shoe store	2
3. Tailoring	19	32. Telegraph company	2
4. Overall company	16	33. Underwear company	2
5. Candy and gum factory	6	34. Uniform factory	2
6. Clothing company	6	35. Bakery	1
7. Soap company	6	36. Broom company	1
8. House work	5	37. Candy store	1
9. Paper box factory	5	38. Cap company	1
10. Flag company	4	39. Cigar company	1
11. Shirt factory	4	40. Clothing—retail	1
12. Telephone company	4	41. Coffin company	1
13. Grocery	3	42. Cotton goods	1
14. Paper goods	3	43. Dentist	1
15. Printing	3	44. Electric company	1
16. Saloon and distillery	3	45. Ice company	1
17. Art company	2	46. Investment company	1
18. Building concern	2	47. Letter shop	1
19. Color card company	2	48. Mattress company	1
20. Creamery	2	49. Mop factory	1
21. Five and ten cent store	2	50. Novelty company	1
22. Garter company	2	51. Optician	1
23. Glass company	2	52. Public library clerk	1
24. Iron works	2	53. Rug factory	1
25. Lace and embroidery	2	54. Sporting goods	1
26. Laundry	2	55. Truss company	1
27. Magazine publishing company	2	56. Woolen mills	1
28. Millinery—wholesale	2	57. Yeast company	1
29. Piano company	2	Total	207

The facts can be summed up as follows: The number of positions becomes less each year, both because the number of girls represented is smaller from year to year and because the number of positions per girl becomes smaller. The number of industries employing more than 1 per cent of the girls varies only from 11 to 16, and this variation is due in part to subdivisions of the sewing trade in later years. The number of industries employing girls increases during the first three years, but falls again in the fourth. The increase of the first three years takes place in spite of the fact that both the number of girls and the number of positions per girl become less. The proportion of girls employed by the group of industries which takes 1 or more per cent is materially less in the last two years than in the first two. It is 87 and 86 per cent the first two years and 64 and 72 per cent the last two. The proportion of girls distributed through the miscellaneous industries rises from 13 and 14 per cent in the first years to 36 and 28 per cent in the last two. The figures show a tendency analogous to that of the boys, though by no means so consistent, for the girls to become more widely distributed through industries with successive years of employment.

The chief contrasts between these figures and the corresponding ones for boys are that girls enter fewer industries, are much more concentrated in the group of industries employing 1 per cent or more, and have a smaller proportion in the miscellaneous group. While boys entered 108 industries during the first year, girls entered only 46. During the fourth year boys entered 143 industries, and girls only 57. Thus boys had access to two and a half times as many industries as girls. The miscellaneous group constituted 13 per cent of the girls and 25 per cent of the boys during the first year. During the fourth year it comprised 28 per cent of the girls and 47 per cent of the boys. The industry which assumes greatest numerical importance for girls is the same as that for the boys—the shoe industry. It stands first in importance every year except the second, when it takes second place. The proportion of girls in the shoe industry decreases from 26 per cent during the first year to 20 per cent during the fourth. The second industry in importance is the tailoring branch of the sewing trade. It employs 24 per cent of the girls during the first two years, chiefly in routine jobs like basting a seam, pulling bastings, or running errands, but drops to 10 per cent in the third and fourth year. By this time the girls are old enough to do machine operating, and they enter the overall, clothing, and shirt factories which appear on the list in the third and fourth years. If all the branches of the sewing industry, including machine operating in factories, are classed together, the industry employs each year from 21 to 24 per cent of the girls. Thus shoe factories and the various branches of the sewing trade employ almost half of the total number of girls. Department stores are third in the list in numerical importance. They employ 14 per cent the first year, 12 per cent the second year, 7 per cent the third year, and 10 per cent the fourth. The next occupations in order of importance are paper box factories, which employ from 7 to 2 per cent in various years; candy factories, which employ from 5 to 3 per cent; soap factories, which employ 2 or 3 per cent; and domestic work, which employs from 2 to 4 per cent. No other occupations are represented every year.

The chief occupations which are added in the third and fourth years are printing and binding, and telephone operating, represented by about 2 per cent of employed girls.

The relation between kind of industry entered and school grade completed is shown in Table 603. Shoe factories have a larger proportion of lower than of upper grade girls. The eighth grade, after the first year, is represented by much smaller proportions in the shoe factory than the lower grades. The tendency in the department stores is the reverse.

TABLE 603

KIND OF INDUSTRY ENTERED — BY SCHOOL GRADE COMPLETED

Girls

First Year

Kind of Industry	Grade V		Grade VI		Grade VII		Grade VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1. Shoe factory	46	34.1	52	29.4	30	18.7	19	22.1
2. Tailoring	33	24.6	36	20.4	45	27.9	19	22.1
3. Department store	8	6.0	16	9.1	28	17.4	26	30.2
4. Paper box factory	15	11.1	14	7.9	7	4.2	2	2.3
5. Candy factory	7	5.2	13	7.4	10	6.2	0	.0
6. Millinery	2	1.5	3	1.7	6	3.7	2	2.3
7. Soap company	1	.7	5	2.8	2	1.2	4	4.6
8. Domestic service	6	4.3	2	1.1	3	1.9	0	.0
9. Paper goods company	0	.0	5	2.8	2	1.2	3	3.4
10. Garter factory	1	.7	1	.6	4	2.5	0	.0
11. Knitted goods company	1	.7	3	1.7	2	1.2	0	.0
Miscellaneous	15	11.1	27	15.3	22	13.6	11	12.8
Total	135	100.0	177	100.2	161	99.7	86	99.9

Second Year

Kind of Industry	Grade V		Grade VI		Grade VII		Grade VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1. Tailoring	21	20.7	25	21.2	39	32.8	14	17.7
2. Shoe factory	22	21.7	33	28.0	27	22.7	11	14.0
3. Department store	7	6.9	9	7.6	14	11.8	19	24.1
4. Paper box factory	6	5.9	7	5.9	4	3.4	6	7.6
5. Domestic service	10	9.9	2	1.7	4	3.4	0	.0
6. Candy factory	3	3.0	7	5.9	2	1.7	0	.0
7. Soap company	2	2.0	5	4.3	1	.8	3	3.8
8. Paper goods company	3	3.0	4	3.4	0	.0	2	2.5
9. Grocery	3	3.0	2	1.7	2	1.7	1	1.3
10. Printing and binding	2	2.0	2	1.7	2	1.7	1	1.3
11. Knitted goods	3	3.0	1	.9	3	2.5	0	.0
12. Millinery	1	1.0	0	.0	4	3.4	2	2.5
13. Feather factory	2	2.0	4	3.4	0	.0	0	.0
14. Garter factory	1	1.0	1	.9	4	3.4	0	.0
15. Art company	0	.0	2	1.7	1	.8	2	2.5
Miscellaneous	15	14.9	14	11.9	12	10.1	18	22.9
Total	101	100.2	118	100.2	119	100.2	79	100.2

TABLE 603—*Continued*

Girls

THIRD YEAR

KIND OF INDUSTRY	GRADE V		GRADE VI		GRADE VII		GRADE VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1. Shoe factory	9	19.6	23	28.8	17	19.5	6	13.6
2. Tailoring	7	15.2	8	10.0	7	8.1	4	9.1
3. Department store	2	4.4	6	7.5	7	8.1	3	6.8
4. Overall factory	2	4.4	4	5.0	8	9.2	0	.0
5. Candy factory	2	4.4	3	3.8	1	1.2	2	4.5
6. Clothing factory	1	2.2	3	3.8	3	3.3	1	2.3
7. Grocery	1	2.2	2	2.5	2	2.3	3	6.8
8. Housework	1	2.2	2	2.5	2	2.3	1	2.3
9. Soap company	0	.0	3	3.8	1	1.2	2	4.5
10. Shirt factory	0	.0	1	1.2	4	4.8	1	2.3
11. Paper box factory	1	2.2	2	2.5	2	2.3	0	.0
12. Printing company	1	2.2	1	1.2	2	2.3	1	2.3
Miscellaneous	19	41.3	22	27.5	31	35.6	20	45.5
Total	46	100.3	80	100.1	87	100.2	44	100.0

FOURTH YEAR

KIND OF INDUSTRY	GRADE V		GRADE VI		GRADE VII		GRADE VIII	
	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent	No. of Cases	Per Cent
1. Shoe factory	9	24.4	15	27.8	14	17.7	3	8.1
2. Department store	2	5.4	4	7.4	9	11.4	5	13.5
3. Tailoring	2	5.4	4	7.4	8	10.1	5	13.5
4. Overall company	4	10.8	5	9.3	4	5.0	3	8.1
5. Candy factory	2	5.4	2	3.7	1	1.3	1	2.7
6. Clothing company . . .	2	5.4	2	3.7	1	1.3	1	2.7
7. Soap company	0	.0	2	3.7	2	2.5	2	5.4
8. Housework	1	2.7	3	5.6	1	1.3	0	.0
9. Paper box factory	1	2.7	0	.0	3	3.8	1	2.7
10. Flag company	2	5.4	0	.0	2	2.5	0	.0
11. Shirt factory	1	2.7	0	.0	3	3.8	0	.0
12. Telephone company . . .	0	.0	1	1.9	2	2.5	1	2.7
13. Grocery	0	.0	1	1.9	2	2.5	0	.0
14. Paper goods	1	2.7	0	.0	1	1.3	1	2.7
15. Printing	0	.0	0	.0	2	2.5	1	2.7
16. Saloon and distillery . .	1	2.7	0	.0	1	1.3	1	2.7
Miscellaneous	9	24.4	15	27.8	23	29.1	12	32.4
Total	37	100.1	54	100.2	79	99.9	37	99.9

Eighth-grade girls have a decided preference in that occupation from the start—a preference which means conscious selection of the superior type of girl by the department store. The other groups show little relation to school grade, and are too small to be expected to do so.

The girls, after the first year, have—like the boys—a larger percentage of miscellaneous positions in the eighth grade than in any of the lower grades. The variety of positions open to the eighth-grade girl is thus seen to be greater than that for lower-grade girls.

SUMMARY OF CHAPTER X

I. *Wages.*

Wages are recorded both in terms of total yearly earnings for the four years from fourteen to eighteen, and in terms of average weekly wage for the number of weeks employed.

(1) With Relation to Age.

Both methods of measuring wages show a steady increase in wage from year to year such that in the fourth year wages are more than double those of the first year for both sexes.

(2) With Relation to School Grade Completed at Fourteen Years.

Whether measured by total yearly earnings or by average weekly wage, wages show no relationship to school grade. Throughout the four years, boys and girls who had completed only the fifth grade at fourteen years have as good an earning capacity as those who had completed the eighth grade at fourteen.

(3) With Relation to Sex.

Boys are better wage-earners from the start than girls, and increase their advantage from year to year, though the ratio of girls' to boys' wages remains about the same.

II. *Steadiness of employment.*

Steadiness of employment was measured both in terms of the number of weeks employed each year and of the number of positions held.

(1) With Relation to Age.

There is little unemployment among these children at any age. Three-fourths or more of them each year were employed fifty weeks or more. Unemployment becomes less each year for the first three years. There is also little shifting of positions. The average number of positions is only 2 the first year and is reduced to 1.5 the fourth year.

(2) With Relation to School Grade.

The upper-grade children have a somewhat better record for steadiness of employment than the lower-grade children. Both the amount of unemployment and the number of shifts of position are somewhat greater for fifth-grade than for eighth-grade children.

(3) With Relation to Sex.

Girls have more unemployment than boys during the first two years, but there is little difference in the last year. Girls have fewer shifts of position than boys in any year.

III. *Kind of work done.*

(1) With Relation to Age.

The significant shifts in kind of work done consist in the increase of office work from year to year for both sexes, the increase of factory work for boys, the decrease of errand work for boys, and the appearance of some types of semi-skilled work for both sexes in the third and fourth years.

(2) With Relation to School Grade Completed.

For both sexes, factory work occupies a larger proportion of the children of the lower than of the upper grades and office work a much larger proportion of the children of the upper than of the lower grades. Helpers in stores and offices are more numerous among upper- than among lower-grade children.

(3) With Relation to Sex.

Factory work of some type constitutes the largest occupation for both sexes. Girls are somewhat more numerous than boys in office work. Sewing is a large occupation for girls, but a negligible one for boys. Running errands constitutes a large occupation for boys during the first two years, but a negligible one for girls. Printing is a large occupation for boys, but nonexistent for girls. The types of semi-skilled work open to them also differ.

IV. *Number of industries entered.*

(1) With Relation to Age.

The variety of industries in which children are employed increases steadily from year to year, and their concentration in a few industries decreases.

(2) With Relation to School Grade Completed.

Because of the comparatively small number of children in any one industry, little information is to be derived from the distribution by school grade. The chief point is that a greater variety of industries is open to children who have completed the eighth grade than to those from lower grades.

(3) With Relation to Sex.

About two and a half times as many industries are entered by boys as by girls. Girls are to a greater extent than boys concentrated in a few industries.

CHAPTER XI

INDUSTRIAL LIFE IN RELATION TO RATINGS IN MENTAL AND PHYSICAL TESTS

One of the most interesting topics to consider with regard to such a series as the present one, is what relation—if any—exists between native ability, either mental or physical, and various phases of industrial life. Educators have indulged in a great deal of theory as to the value of education in relation to earning capacity, as to the ultimate financial reward of the faithful and steady worker, and as to the unlimited chances of promotion for the really able. What bearing have the facts of our series upon these topics? In attempting to answer this question three kinds of evidence will be offered in this chapter: first, a study of correlations between rating in mental and physical tests on the one hand and wages and steadiness of employment on the other; second, a study of the mental and physical ratings of children employed in various industries; and third, a study of the industrial careers of the children who ranked extremely high and of those who ranked extremely low in mental and physical tests.

A Study of Correlations between Rating in Mental and Physical Tests and Wages and Steadiness of Employment

Our first attempt to analyze the complicated human relationships involved consisted in working out correlations between the average percentile ranks, mental and physical, and each of the factors of industrial life which we have summed up in numerical terms. The correlations were worked separately for each year. We will consider first, correlations with the average percentile rank in physical tests; and second, correlations with the average percentile rank in mental tests. The factors of industrial history usable in working correlations are total yearly earnings, average weekly wage, number of weeks employed, and number of positions held. The kind of work done could not be taken into account. Correlations were worked between the fourteen-year average and the first year of industrial history; the fifteen-year average and the second year; and so on. For this reason the eighteen-year average does not appear in these correlations.

Correlations with average percentile rank in physical tests are presented in Table 604. The most striking thing about the tables is that the correlations are all so small. The highest one in the entire series is .25. The fact that there is so limited a distribution of the factors of number of weeks employed and number of positions held would lead one to expect small correlations with those factors, but there is no such explanation of the small correlations with wage statistics. We must conclude that ability in physical tests plays a small part in determining either earning capacity or steadiness of employment. The other striking point about the table is that while the correlation of ability in physical tests with the desirable factors of industrial life is positive in the case of the boys, it tends to be negative in the case of the girls. While there is a slight tendency for boys who stand well in physical tests to have an advantage in earning capacity, and to a less extent in steadiness of employment, the reverse is true for girls. On the whole, girls who stand well in physical tests display a slight tendency to earn less and to be employed more irregularly than girls who stand poorly in the tests. The correlations are all so small that only their consistency from year to year leads us to feel that any stress should be placed upon them.

TABLE 604

CORRELATIONS OF AVERAGE PERCENTILE RANKS IN PHYSICAL TESTS WITH EARNING CAPACITY AND REGULARITY OF EMPLOYMENT

Average of Physical Tests — Total Yearly Wage

Age	Boys	Girls
14	.17	−.001
15	.24	−.17
16	.22	−.10
17	.02	−.09

Average of Physical Tests — Average Weekly Wage

Age	Boys	Girls
14	.15	.04
15	.23	−.14
16	.25	.17
17	.07	−.08

Average of Physical Tests — Number of Weeks Employed

Age	Boys	Girls
14	.09	−.12
15	−.03	−.16
16	.02	−.005
17	−.06	−.13

Average Physical Tests — Number of Positions Held

Age	Boys	Girls
14	−.04	.09
15	−.01	.06
16	−.06	.09
17	.03	.13

The correlations between average percentile rank in mental tests and the several factors of industrial history are presented in Table 605. These correlations are even smaller than correlations with average percentile ranks in physical tests. The largest one in the series is .13. Most of them are less than .10. We must conclude that rank in mental tests has still less to do with earning capacity or regularity of employment during the first four years in industry than rank in physical tests. In this case the correlations with earning capacity are positive for both girls and boys (with one exception). The correlations with factors of regularity are so small and so inconsistent that they seem to indicate no relationship whatever, except that girls have consistently negative correlations with the number of positions held, showing a tendency to less shifting among mentally superior girls.

TABLE 605

CORRELATIONS OF AVERAGE PERCENTILE RANKS IN MENTAL TESTS WITH EARNING CAPACITY AND REGULARITY OF EMPLOYMENT

Average of Mental Tests — Total Yearly Wage

Age	Boys	Girls
14	.09	.08
15	.10	.03
16	.09	.12
17	.02	.004

Average of Mental Tests — Average Weekly Wage

Age	Boys	Girls
14	.09	.02
15	.08	.05
16	.02	.10
17	−.09	.01

Average of Mental Tests — Number of Weeks Employed

Age	Boys	Girls
14	.03	.05
15	−.001	−.07
16	.002	.10
17	.12	−.02

Average of Mental Tests — Number of Positions Held

Age	Boys	Girls
14	.13	−.07
15	.09	−.03
16	−.06	−.02
17	.06	−.007

A Study of the Mental and Physical Ratings of Children Employed in Various Industries

As a basis for judging the mental and physical requirements of the leading industries represented, we selected the few occupations for each sex in which twenty or more individuals were found during most of the years. The averages of the percentile ranks—both in mental and in physical tests—were taken according to occupation and are presented in Tables 606 and 607. Since the average percentile rank is not directly comparable from year to year, each value was rated on the ten-percentile scale of average percentile ranks for the year in question (see Chapter V, Tables 208 and 313). For employments of the first year the fourteen-year scale of working children was used, for the employments of the second year the fifteen-year scale, etc. The eighteen-year scale was thus not used at all. The rating on the scale of average percentile ranks appears in the table in parentheses after the group average. An illustration will make the method clear. The average percentile rank in mental tests of boys employed in the metal trades during the first year was 50. The value 50, when graded in the percentile table of average percentile ranks in mental tests of working boys, falls at the fifty-eighth percentile (Table 313). In other words, among fourteen-year-old working boys, there were 58 per cent who had average percentile ranks less than 50 and 42 per cent who had average percentile ranks greater than 50. This procedure makes it possible to compare directly the values in the parentheses.

TABLE 606

AVERAGE PERCENTILE RANK BY INDUSTRY

Boys

METAL TRADES

	First Year	Second Year	Third Year	Fourth Year
Mental	50.0 (58)	44.6 (51)	42.6 (45)	44.1 (48)
Physical	48.8 (62)	46.8 (58)	46.1 (53)	44.0 (42)
No. of Cases	52	39	70	66

PRINTING

	First Year	Second Year	Third Year	Fourth Year
Mental	46.2 (49)	46.7 (57)	48.1 (59)	51.0 (64)
Physical	43.5 (50)	43.9 (50)	48.5 (59)	48.6 (54)
No. of Cases	72	54	38	41

CLERICAL

	First Year	Second Year	Third Year	Fourth Year
Mental	53.1 (65)	54.4 (75)	52.2 (69)	58.3 (79)
Physical	44.5 (52)	44.6 (52)	50.3 (63)	53.4 (65)
No. of Cases	51	78	45	40

SHOE FACTORY

	First Year	Second Year	Third Year	Fourth Year
Mental	45.7 (46)	48.8 (62)	44.8 (51)	48.2 (58)
Physical	43.0 (49)	41.1 (43)	44.9 (50)	45.0 (45)
No. of Cases	121	107	55	32

The four occupations for boys which could be treated by this method are metal trades, printing, clerical work, and shoe factory jobs (Table 606). The most striking point about the table is the fact that clerical workers are so highly selected a group. Their percentile ratings in mental tests run 65, 75, 69, and 79 as compared with the total working group. Had the rating been made on the basis of the general scale which includes both working and school boys (Chapter IV), these clerical workers would fall near the average of the community at large. In physical tests, the clerical workers rate less well than in mental tests, but in physical ability also they are average or above. The basis of selection is higher in the fourth year than in any previous one. The printing trade, on the whole, comes next. The boys who are found in the trade at fourteen are merely the average of the working group, both mentally and physically. In the third and fourth years, however, they are distinctly above average. The suggestion is that while boys are taken into the trade with little selection, only those of an

TABLE 607

AVERAGE PERCENTILE RANK BY INDUSTRY

Girls

YEAR	First Year	Second Year	Third Year	Fourth Year
SHOE FACTORY				
Mental	43.4 (41)	43.5 (45)	42.5 (41)	40.5 (41)
Physical	44.9 (51)	44.7 (51)	44.3 (41)	40.8 (30)
No. of Cases	141	85	51	33
CLERICAL				
Mental	61.0 (78)	61.7 (85)	55.5 (72)	54.5 (74)
Physical	60.4 (84)	55.8 (76)	59.2 (74)	59.0 (70)
No. of Cases	15	18	19	22
DEPARTMENT STORE				
Mental	52.6 (61)	54.2 (72)	45.7 (51)	46.5 (56)
Physical	48.2 (59)	48.8 (62)	51.5 (57)	50.3 (53)
No. of Cases	77	46	23	20
SEWING TRADES				
Mental	49.9 (55)	46.4 (55)	46.8 (53)	47.3 (58)
Physical	45.9 (53)	41.8 (44)	45.8 (44)	44.4 (87)
No. of Cases	144	93	70	42

ability somewhat above average remain and make good. Mental ability seems to be at a somewhat greater premium than physical ability.

The boys in shoe factories rank below those in printing. They fall near the average of the working group in mental ability—in some years above it and in others below. In physical ability they are somewhat below the average of working boys. In the metal trades the quality of boys is less good from year to year. Those found in the trades in the first year are distinctly above average both mentally and physically while those of the fourth year are below average. Brawn is more in demand in this instance than brain. In three of the four years the physical ratings are above the mental. There is comparatively little simple hand work in the metal trades and few boys under sixteen are employed. The majority are eighteen or more. Probably at the younger ages only those of unusual maturity were taken while by the fourth year most of them could meet the requirements.

The four occupations for girls which could be summed up on this basis are shoe factories, clerical work, department-store positions, and sewing trades (Table 607). As in the case of the boys, clerical work shows a much higher degree of selection on the basis of ability than any of the others. The mental ratings on the scale for working girls (see Table 317) are 78, 85, 72, and 74. Physically, also, the clerical workers are a highly selected group with ratings of 84, 76, 74, and 70 (see Table 212). The girls who are clerical workers rank nearer the top of the scale both mentally and physically than the boys. Next to clerical workers in rank come the department-store employees. The department-store girls are also above average both mentally and physically. The mental requirements are more rigid than the physical. Next in order is the sewing trade. In this group the girls are a little above average mentally, but below average physically. The trade seems to make a decidedly greater demand on mental than on physical ability. The girls of the shoe factory are the poorest group of any. Mentally they are below average every year, with ratings of 41, 45, 41, and 41. Physically they are of average rating the first two years, but fall to 41 and 30 in the third and fourth year. The girls of the shoe factory are a relatively poorer lot than the boys. Moreover, while the boys improve in grade with years, the girls decrease. When one reflects upon the fact that most of the skilled and well-paid work of the shoe factory is given to boys and men, the tendency is understandable.

A STUDY OF THE INDUSTRIAL CAREERS OF THE CHILDREN WHO RANKED EXTREMELY HIGH AND OF THOSE WHO RANKED EXTREMELY LOW IN MENTAL AND PHYSICAL TESTS

Since the total correlations with general factors show so little relation between ability, either mental or physical, and earning capacity or steadiness of employment, it seemed desirable to attempt to analyze the situation further to see if we could find out why the correlations are so small. As one method of approach to this problem, we decided to make a detailed study of the eight extreme groups of our series—those who ranked highest, mentally and physically, and those who ranked lowest, mentally and physically, in both sexes.

SELECTION OF EXTREME GROUPS

In selecting the cases, we first took out of the total series all those for whom three or more annual tests were on record. We then averaged the yearly average percentile ranks for each of these individuals, using three, four, or five values in taking the final average, according to the number of yearly records found. The total number of cases thus selected and summed up in a single value for mental records and a single value for physical records was, in round numbers, 370 boys and 290 girls. Our final groups for special study contained the 37 boys who stood highest in mental tests, the 37 who stood lowest in mental tests, the 37 who stood highest in physical tests, and the 37 who stood lowest in physical tests. The corresponding groups of girls contained 29 each.

Since the selections were made independently for each group, we found after the lists were complete certain individuals who appeared in two groups. These overlappings are of some interest. Of the 37 boys who ranked in the highest 10 per cent mentally, 9, or about one-fourth, were also found among the 37 cases who ranked in the highest 10 per cent physically. Of the 37 boys who ranked in the lowest 10 per cent mentally, 5, or about one-seventh, were also found among the 37 of the lowest 10 per cent physically. There was no instance among the boys of an individual who ranked in the highest 10 per cent mentally and the lowest 10 per cent physically or vice versa.

Of the 29 girls who ranked in the highest 10 per cent mentally, 7, or almost one-fourth, were also found in the highest 10 per cent physically. Of the 29 girls who ranked in the lowest 10 per cent mentally, 7, or almost one-fourth, were also found in the lowest 10 per cent physically. The girls' series presented three cases of coincidence between the highest and lowest groups. One girl in the highest 10 per cent mentally was also found in the lowest 10 per cent physically, and two girls in the lowest 10 per cent menally were also found in the highest 10 per cent physically.

The exact distribution of the cases in terms of final mental average and final physical average is given in Table 608. The average percentile ranks of the highest 10 per cent of boys in physical tests ranged from 84 down to 65, with a group average of 72. The average percentile ranks of the highest 10 per cent of girls ranged from 84 down to 64 with a group average of 72. The lowest 10 per cent of boys in physical tests ranged from a final average of 15 up to one of 29, with a group average of 23. The lowest 10 per cent of girls in physical tests ranged from a final average of 15 up to one of 31, with a group average of 26. The extreme groups in physical tests were thus separated by a distance of 49 points in average percentile rank in the case of boys, and 46 points in the case of girls.

TABLE 608

FINAL AVERAGE PERCENTILE RANK (3 TO 5 YEARS)

Highest 10 Per Cent—Physical

Distribution of Five-Year Physical Average

Boys		*Girls*	
Av. Per. Rank	No.	Av. Per. Rank	No.
84	1	84	1
83	2	82	1
80	1	81	1
78	3	80	2
76	2	76	1
75	1	75	1
74	3	74	2
73	3	73	1
72	2	72	2
71	1	71	2
70	1	70	2
69	3	69	1
68	1	68	3
67	4	67	3
66	5	66	3
65	4	65	2
		64	1
	37		29
Average	72	Average	72

Lowest 10 Per Cent—Physical

Av. Per. Rank	No.	Av. Per. Rank	No.
15	1	15	2
16	1	17	2
17	2	21	2
19	1	22	2
20	3	24	2
21	8	25	2
22	2	26	2
23	2	27	1
24	2	28	2
25	2	29	4
26	5	30	7
27	4	31	1
28	2		
29	2		
	37		29
Average	23	Average	26

TABLE 608—*Continued*

Highest 10 Per Cent—Mental

Distribution of Five-Year Mental Average

Boys		*Girls*	
Av. Per. Rank	No.	Av. Per. Rank	No.
81	1	78	1
80	1	75	3
79	1	74	1
77	1	73	1
76	4	72	1
75	2	70	3
74	3	69	4
73	2	68	3
71	3	67	2
69	3	66	5
68	7	65	5
67	5		
66	4		
	37		29
Average	71		69

Lowest 10 Per Cent—Mental

Av. Per. Rank	No.	Av. Per. Rank	No.
17	1	18	3
19	2	19	2
21	1	20	1
22	1	21	1
23	2	22	2
24	6	23	2
25	3	24	2
26	5	25	4
27	3	26	3
28	7	27	3
29	3	28	3
30	3	29	3
	37		29
Average	26		24

The range of the highest 10 per cent of boys in mental tests was from 81 down to 66, with a group average of 71. For girls the range of the highest 10 per cent was from 78 down to 65, with a group average of 69. The lowest 10 per cent of boys ranged from a final average of 17 up to one of 30, with a group average of 26. For girls the range of the lowest 10 per cent mentally was from a final average of 18 up to one of 29, with a group average of 24. The difference in average percentile rank between the two extreme groups, both boys and girls, was thus represented by 45 points. The divergences of the groups thus established are wide. Since the estimate is based on a large number of measures, repeated from three to five times at intervals of a year or more, we can feel confident that the samples selected represent the extremes of mental and physical ability in the community, in so far as tests of this type are capable of measuring ability. Each of the four groups for each sex was summed up separately with regard to school grade completed, total yearly wage, average weekly wage, number of weeks employed, number of positions held, and kind of work done.

SCHOOL GRADE COMPLETED BY EXTREME GROUPS

The relation of the eight groups to school grade completed is shown in Table 609. There is a positive relation to school grade, both with reference to physical tests and with reference to mental tests. The children who rank low, physically and mentally, are far more numerous in the fifth and sixth grades, and those who rank high, physically and mentally, in the seventh, eighth, and ninth. Of the 37 boys who ranked highest physically, 15 were found in the two lower grades and 22 in the upper grades. Of the 37 who ranked lowest physically, 30 were found in the two lower grades and 7 in the upper grades. Of the 37 boys who ranked highest mentally, 5 were found in the two lower grades and 32 in the two upper ones. Of the 37 who ranked lowest mentally, 35 were found in the two lowest grades and 2 in the upper grades. The proportion for the girls is very similar. Of the 29 girls who ranked highest physically, 8 were found in the two lowest grades and 21 in

TABLE 609

SCHOOL GRADE COMPLETED BY CHILDREN IN THE HIGHEST AND LOWEST 10 PERCENTS, IN PHYSICAL TESTS AND MENTAL TESTS

Boys

	Grade V	Grade VI	Grade VII	Grade VIII	Grade IX	Total
Highest physical	5	10	12	8	2	37
Lowest physical	17	13	6	1	0	37
Highest mental	1	4	13	19	0	37
Lowest mental	28	7	2	0	0	37
Totals	51	34	33	23	2	

Girls

	Grade V	Grade VI	Grade VII	Grade VIII	Grade IX	Total
Highest physical	2	6	12	8	1	29
Lowest physical	8	12	8	1	0	29
Highest mental	1	1	12	13	2	29
Lowest mental	11	14	3	1	0	29
Totals	22	33	35	23	3	

the upper grades. Of the 29 who ranked lowest physically, 20 were found in the two lower grades and 9 in the upper ones. Of the 29 girls who ranked highest mentally, 2 were found in the two lower grades and 27 in the upper ones. Of the 29 who ranked lowest mentally, 25 were found in the two lower grades and 4 in the upper ones.

We can conclude, then, that the selection of superior and inferior individuals made by the tests is similar to, though not identical with, the selection made by the school. Selection made on the basis of mental tests coincides more closely with that of the school than selection made on the basis of physical tests.

EARNING CAPACITY OF EXTREME GROUPS

The comparison of the extreme groups in earning capacity was made as follows: each individual was given a percentile rating in earnings first on the ten-percentile scale of yearly earnings, and second on the ten-percentile scale of average weekly wages. (See Chapter X.) The distributions of these ratings are given in full for each group in tabular form (Table 610). The percentile ratings of each group were also averaged. An illustration will make the method clear. In Table 610, the section dealing with the boys who ranked highest in physical tests is to be interpreted thus: of the 36 boys in the group, 7 were found in the highest 10 per cent (the one-hundredth percentile) in yearly earnings for the first year, 7 were found in the next to the highest 10 per cent (the ninetieth percentile), etc. The average of the percentile ratings in yearly earnings for the entire 36 boys of the group was 62 for the first year.

The comparisons of the four extreme groups of boys in yearly earnings are found in Table 610. A glance at the table shows the wide distribution of earning capacity in all of the four groups. Records are found scattered from the top to the bottom of the scale of earnings in every one of the four. The average of the percentile ranks for the group is the value that has been used in group comparisons. To facilitate comparison Table 611 has been prepared, in which the difference between the highest and lowest groups is expressed in terms of difference between percentile averages, and Table 612, in which the difference is expressed in terms of difference in earning capacity in dollars.

A comparison of the average percentile ranks in yearly earnings between the boys who rank highest physically and those who rank lowest physically shows that the group who ranked highest physically had a real advantage in earning capacity (Table 610). The group average of percentile ranks in earning capacity was during the first year 27 points higher for those in the highest 10 per cent physically than for those in the lowest 10 per cent, during the second year it was 32 points higher, during the third year 31 points higher, and during the fourth year 24 points higher (Table 611).

TABLE 610

PERCENTILE RATING IN EARLY EARNINGS

Boys

Highest 10 Per Cent Physical					Lowest 10 Per Cent Physical				
Percentiles	First Year	Second Year	Third Year	Fourth Year	Percentiles	First Year	Second Year	Third Year	Fourth Year
100	7	7	7	8	100			1	2
90	7	10	9	3	90	1	3	2	
80	5	4	3	7	80	3	1	1	1
70		1	3	1	70		3		3
60	3	1	5	2	60	3	2		5
50	2	4	3	2	50	3	3	8	3
40	1	2		3	40	6	2	4	3
30	2	4	3	4	30	3	6	6	3
20	2			1	20	11	8	5	4
10	7	3	3	1	10	7	8	5	4
No. of Cases.	36	36	36	32	No. of Cases	37	36	32	28
Aver. of Percentile Ranks . .	62	69	70	69	Aver. of Percentile Ranks . .	35	37	39	45

Highest 10 Per Cent Mental					Lowest 10 Per Cent Mental				
Percentiles	First Year	Second Year	Third Year	Fourth Year	Percentiles	First Year	Second Year	Third Year	Fourth Year
100	3	2	3	2	100	3	4	3	2
90	5	4	7	4	90	1		1	
80	7	7	3	3	80	3	3	2	2
70	3	3	2	4	70		1	3	2
60	3	5	2	2	60	1		2	4
50	6	4	3	4	50	3	2	8	1
40	2	2	3	3	40	5	4	1	6
30	3	2	4	3	30	3	8	1	6
20	1	5	4	4	20	4	6	1	3
10	4	3	6	5	10	13	6	6	2
No. of Cases.	37	37	37	34	No. of Cases.	36	34	28	28
Aver. of Percentile Ranks . .	63	57	53	51	Aver. of Percentile Ranks . .	37	41	51	46

These values can be readily interpreted in terms of dollars by reference to the ten-percentile scale of yearly earnings in Chapter X. When so converted, they show that during the first year the boys of the highest 10 per cent in physical ability earned on an average $27.00 a year more than those of the lowest 10 per cent; during the second year they earned $58.00 more; during the third year $83.00 more; and during the fourth year $91.00 more (Table 612). In interpreting these results, the greater elimination of the boys in the lowest group must be borne in mind. It is quite possible that the worst of the failures in the lowest group were lost completely.

The corresponding comparison based on the earning capacity of the boys in the highest and lowest 10 per cent groups mentally, show that the boys of the best 10 per cent mentally, also earn more than those of the

TABLE 611

DIFFERENCES IN GROUP PERCENTILE AVERAGES

HIGHEST 10 PER CENT LESS LOWEST 10 PER CENT

Boys

	PHYSICAL			
	First Year	Second Year	Third Year	Fourth Year
Yearly wage	+27	+32	+31	+24
Weekly wage	+26	+35	+35	+29
	MENTAL			
Yearly wage	+26	+16	+ 2	+ 5
Weekly wage	+10	+16	+ 6	− 5

TABLE 612

DIFFERENCES IN DOLLARS

HIGHEST 10 PER CENT LESS LOWEST 10 PER CENT

Boys

	PHYSICAL			
	First Year	Second Year	Third Year	Fourth Year
Yearly wage	+$27.00	+$58.00	+$83.00	+$91.00
Weekly wage	+$ 0.45	+ 1.20	+ 1.18	+ 1.65
	MENTAL			
Yearly wage	+$26.00	+$28.00	+$ 4.00	+$17.00
Weekly wage	+$ 0.17	+ 0.53	+ 0.28	− 0.27

TABLE 613

PERCENTILE RATING IN AVERAGE WEEKLY WAGES

Boys

Highest 10 Per Cent Physical					Lowest 10 Per Cent Physical				
Percentiles	First Year	Second Year	Third Year	Fourth Year	Percentiles	First Year	Second Year	Third Year	Fourth Year
100	9	7	12	9	100	1		3	
90	6	6	4	3	90	4	1	1	3
80	3	6	3	5	80	3	2	2	
70	3	3	5	3	70		1		1
60	2	2	2	1	60	5	4	2	4
50	1	1		3	50		4		4
40		3	3	2	40	1	1	2	3
30	5	3	2	4	30	7	5	6	6
20	5	2	3	2	20	4	5	8	4
10	2	2	1		10	12	13	8	4
No. of Cases	36	35	35	32	No. of Cases	37	36	32	29
Aver. of Percentile Ranks . .	65	68	72	70	Aver. of Percentile Ranks . .	39	33	37	41

Highest 10 Per Cent Mental					Lowest 10 Per Cent Mental				
Percentiles	First Year	Second Year	Third Year	Fourth Year	Percentiles	First Year	Second Year	Third Year	Fourth Year
100	3	3	9	3	100	2	3	4	1
90	3	3	4	2	90	2	1	1	4
80	7	5	1	3	80	3	3	3	1
70	5	5	1	2	70	5	1	3	2
60	4	3	1	3	60	4	5	1	3
50	2	5		5	50	1	2	1	5
40	1	5	4	3	40	3		4	2
30	5	1	5	4	30	7	4	2	2
20	4	6	6	3	20		9	2	5
10	3	1	6	6	10	9	8	9	3
No. of Cases	37	37	37	34	No. of Cases	36	36	30	28
Aver. of Percentile Ranks . .	57	57	53	44	Aver. of Percentile Ranks . .	47	41	47	49

lowest 10 per cent though the differences are smaller (Table 610). The difference in percentile average in favor of the highest 10 per cent is 26 points the first year, 16 points the second year, 2 points the third year, and 5 points the fourth year (Table 611). Interpreted in terms of dollars this means that during the first year the boys of the highest 10 per cent mentally earn on an average $26.00 more than those of the lowest 10 per cent; during the second year they earned $28.00 more; during the third year $4.00 more; and during the fourth year $17.00 more (Table 612).

The comparison of the extreme groups of boys based on average weekly wage is presented in detail in Table 613. The statement of the differences between the highest and lowest groups, mentally and physically, is given first in terms of group average percentile rank in earnings (Table 611), and second in terms of dollars per week (Table 612). Average weekly wage is an estimate of earning capacity which is not influenced by the number of weeks employed, as is total yearly earnings. The boys of the highest 10 per cent in physical tests are decidedly superior in average weekly wage to those of the lowest 10 per cent. The difference beween the averages of the percentile ranks of the two groups is 26 points the first year, 35 points the second, 35 points the third, and 29 points the fourth. Translating these differences into dollars, by reference to the ten-percentile scale of average weekly wage in Chapter X, shows that during the first year the boys of the highest 10 per cent in physical tests earned $0.45 a week more than those of the lowest 10 per cent; during the second year $1.20 a week more; during the third year $1.18 a week more; and during the fourth year $1.65 a week more.

The boys of the highest 10 per cent in mental measurements show a slight superiority in average weekly wage during the first three years, but a slight inferiority the fourth year (Table 613). The difference between the group averages of percentile ranks of the highest and lowest 10 per cent in mental tests is 10 points in favor of the highest group the first year, 16 points the second year, and 6 points the third year. During the fourth year the difference is 5 points in favor of the lowest group (Table 611). Translating these values into dollars, by reference to the scale of average weekly wages, we find that during the first year the boys of the highest 10 per cent in mental tests earned $0.17 a week more than those of the lowest 10 per cent; during the second year $0.53 a week more; during the third year $0.28 a week more; and during the fourth year $0.27 a week less (Table 612).

We may conclude, then, that physical superiority gives boys a real advantage in earning capacity, which is evident both in yearly earnings and in average weekly wage throughout the first four years in industry. Mental superiority gives a much smaller advantage than physical superiority. Moreover, the advantage due to mental superiority seems to be decreasing with years. It is less during the last two than during the first two years.

TABLE 614

PERCENTILE RATINGS IN YEARLY EARNINGS

Girls

Highest 10 Per Cent Physical					Lowest 10 Per Cent Physical				
Percentiles	First Year	Second Year	Third Year	Fourth Year	Percentiles	First Year	Second Year	Third Year	Fourth Year
100		3	2	1	100	2	1	2	2
90	3		1		90	1	4	1	1
80	3	3	3	3	80	3	3		3
70	2	3	2	2	70	8	3	3	2
60	1	4	4	2	60	6	2	4	1
50	2		2		50	2	7	4	1
40	2	2	1		40	2	1	4	4
30	4		4	1	30	1	3	2	3
20	1	2	1	2	20	1	2	2	2
10	7	7	4	8	10	2	2	3	3
No. of Cases	25	24	24	19	No. of Cases	28	28	25	22
Aver. of Percentile Ranks . .	44	49	51	39	Aver. of Percentile Ranks . .	61	56	49	50

Highest 10 Per Cent Mental					Lowest 10 Per Cent Mental				
Percentiles	First Year	Second Year	Third Year	Fourth Year	Percentiles	First Year	Second Year	Third Year	Fourth Year
100	3	2	3	1	100	1	1	1	5
90	2	4	1	2	90	2	2	3	
80	1	4	2	1	80	3	4	1	4
70	1	1	3	1	70	3	3	2	1
60	1	1	4	2	60	5	2	4	1
50	1	1	2	1	50	1	2	3	1
40	4	3	2	4	40	1	3	2	1
30	2	2	2	1	30	1	2	1	2
20	3	4	3	3	20	5	2	4	4
10	10	3	3	6	10	7	4	2	3
No. of Cases	28	25	25	22	No. of Cases	29	25	23	22
Aver. of Percentile Ranks . .	40	54	53	41	Aver. of Percentile Ranks . .	39	52	52	55

The complete distributions of percentile ratings in yearly earnings of the girls of the four extreme groups are given in Table 614. The differences between the group averages of percentile ranks are given in Table 615, and the same differences interpreted as dollars in Table 616. A comparison of the yearly earnings of girls in the highest and lowest 10 per cent physically shows that in three of the four years the girls who rank highest earn less than the girls who rank lowest. The difference between the averages of the percentile ranks for the two groups is 17 points in favor of the lowest group the first year, 7 points the second year, and 11 points the fourth year. During the third year the highest group was 2 points ahead of the lowest. Interpreted in terms of dollars this means that during the first year the lowest 10 per cent physically earned $27.00 a year more than the

TABLE 615

DIFFERENCES IN GROUP PERCENTILE AVERAGES

Girls

HIGHEST 10 PER CENT LESS LOWEST 10 PER CENT

	First Year	Second Year	Third Year	Fourth Year
	PHYSICAL			
Yearly wage	−17	−7	+2	−11
Weekly wage	− 4	0	+4	− 7
	MENTAL			
Yearly wage	+ 1	+ 2	+1	−14
Weekly wage	−13	+ 4	−1	−10

TABLE 616

DIFFERENCES IN DOLLARS

HIGHEST 10 PER CENT LESS LOWEST 10 PER CENT

	First Year	Second Year	Third Year	Fourth Year
	PHYSICAL			
Yearly wage	−$27.00	−$12.00	+$6.00	−$21.00
Weekly wage	− 0.07	0	+ 0.16	− 0.28
	MENTAL			
Yearly wage	+ $1.00	+ $3.00	+$3.00	−$28.00
Weekly wage	− 0.23	+ 0.15	− 0.04	− 0.41

TABLE 617

PERCENTILE RATING IN AVERAGE WEEKLY WAGES

Girls

Highest 10 Per Cent Physical					Lowest 10 Per Cent Physical				
Percentiles	First Year	Second Year	Third Year	Fourth Year	Percentiles	First Year	Second Year	Third Year	Fourth Year
100	2	2	1	1	100	2	1	2	
90	1	3			90	3	1		3
80	4	2	3	3	80		5	1	2
70	2	1	3	2	70	7	5	2	1
60	4	5	3	1	60	3	1	4	6
50	3	2	2	2	50	6	2	2	1
40		3	1	1	40		8	4	3
30	5	1	4	3	30	5		4	2
20	1		3	2	20		4	2	1
10	3	5	2	4	10	2	1	4	3
No. of Cases.	25	24	22	19	No. of Cases	28	28	25	22
Aver. of Percentile Ranks . .	54	54	49	45	Aver. of Percentile Ranks . .	58	54	45	52

Highest 10 Per Cent Mental					Lowest 10 Per Cent Mental				
Percentiles	First Year	Second Year	Third Year	Fourth Year	Percentiles	First Year	Second Year	Third Year	Fourth Year
100		1	2	1	100		1	2	4
90	5	4	1	1	90	4	2		2
80	3	4	4	3	80	1	4	2	2
70		1	2		70	7	4	4	1
60	2	2	1	2	60	2		2	2
50	2	2		2	50	8	1	1	1
40	1	3	5	4	40	2	2	4	1
30	2	3	5	2	30	2	4	3	2
20	6	3	2	1	20		4	3	2
10	7	2	3	6	10	3	3	2	5
No. of Cases.	28	25	25	22	No. of Cases	29	25	23	22
Aver. of Percentile Ranks . .	43	54	49	43	Aver. of Percentile Ranks . .	56	50	50	53

highest; during the second year $12.00 more; during the third year $6.00 less; and during the fourth year $21.00 more.

A comparison of the two extreme groups of girls in mental tests shows but slight and irregular differences (Table 614). During the first year the highest group is 1 point ahead in yearly earnings, the second year 2 points ahead, the third year 1 point ahead, and the fourth year 14 points behind (Table 615). Interpreted in terms of dollars this means that during the first year the girls of the highest 10 per cent mentally earned an average of $1.00 more than those of the lowest; during the second year $3.00 more; during the third year $3.00 more; and during the fourth year $28.00 less (Table 616).

When the comparison is based on average weekly wage (See Table 617 for distributions and Tables 615 and 616 for summary), a similar state of affairs appears. During the first year, the girls in the highest 10 per cent physically had an average of percentile ranks in weekly wages 4 points lower than those of the lowest 10 per cent; during the second year the two groups had the same average; during the third year the highest group had an average 4 points higher than the lowest group; during the fourth year the highest group had an average 7 points lower than the lowest group. Translating these differences into dollars shows that during the first year the girls of the highest 10 per cent physically earned $0.07 a week less than those of the lowest 10 per cent; during the second year the two groups earned the same; during the third year the highest group earned $0.16 more; and during the fourth year $0.28 a week less.

The comparison of the two extreme groups of girls in mental tests (see Table 617 and summaries in Tables 615 and 616) shows that those of the highest 10 per cent are somewhat inferior in average weekly wage to those of the lowest 10 per cent. The average of the percentile ranks in weekly wages for the highest group mentally is 13 points below that of the lowest group the first year, 4 points above the second year, 1 point below the third year, and 10 points below the fourth year. Translating these values into dollars shows that during the first year the highest group mentally earned $0.23 a week less than the lowest; during the second year $0.15 more; during the third year $0.04 less; and during the fourth year $0.41 less.

SUMMARY OF EARNING CAPACITY

I. The only instance in which ability, either mental or physical, gives a group a rating distinctly above the median for all boys or girls, is that of boys with superior physical skill. Since in the percentile summaries ratings range from 10 as the lowest rank to 100 as the highest, the median of such a scale is 55. The boys of the highest 10 per cent in physical tests rank significantly above 55 in earning capacity, measured either by yearly earnings or by average weekly wage, but no other group shows any superiority to the average.

II. There are two groups which show a marked and consistent rating below the median of all boys and girls—the boys of the lowest 10 per cent physically and the boys of the lowest 10 per cent mentally. Both of these groups show averages distinctly below 55, but the boys who are very inferior physically are at a greater disadvantage than those who are very inferior mentally.

III. The extreme groups of girls, whether superior or inferior, tend to rank a little below the general average in earning capacity. The differences between the two extremes of girls are much less than those between the two extremes of boys, and what difference there is, is of a reverse nature. Girls who are inferior, either mentally or physically, tend to earn a little more than girls who are superior.

IV. The tendency from year to year is for the inferior, whether boys or girls, to improve in earning capacity faster than the superior during the first four years. In the case of the boys, the difference of earning capacity in favor of the superior groups is less in the fourth year than in some previous years. This is entirely true for the two mental extremes, and is true in terms of percentile ratings, though not in terms of dollars, for the two physical extremes. In the case of girls, the superiority in earning capacity of the two inferior groups, mental and physical, is more striking and more consistent in the fourth year than in any previous year.

REGULARITY OF EMPLOYMENT OF THE EXTREME GROUPS

The details with regard to the number of weeks out of the fifty-two that the four extreme groups of boys were employed each year are presented in Table 618. The table as it stands shows that all of the groups had a large proportion—from 50 to 80 per cent—who were employed for the entire fifty-two weeks. It also shows that the proportion of those employed throughout the year was somewhat greater in the last two than in the first two years. The table does not, however, show differences between the extreme groups. Thinking that the mass of detail might obscure real differences, Table 619 was prepared in which an average number of weeks for each group, each year, was figured from Table 618. Even in this form, however, no differences large enough to be significant appear.

In most instances the difference between the extreme groups in average number of weeks employed is less than two weeks. The boys of the highest physical rating are employed a slightly greater number of weeks on the average than the boys of the lowest physical rating except for the second year. The boys of the highest mental rating are also employed a larger average number of weeks during three of the four years. We must conclude

TABLE 618 — NUMBER OF WEEKS EMPLOYED

Boys

No. Wks.	Highest 10 Per Cent Physical								No. Wks.	Lowest 10 Per Cent Physical							
	First Year		Second Year		Third Year		Fourth Year			First Year		Second Year		Third Year		Fourth Year	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent		No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
52	23	64	19	53	28	78	25	78	52	19	57	25	70	21	66	22	79
51	5	14	5	14	1	3			51	4	11	3	8	2	7	1	4
49			1	3	1	3	1	3	49	1	2	1	3	4	13		
47	1	3	3	9	3	9	1	3	47	2	6	1	3	2	6	1	4
45							1	3	45	2	6	1	3	1	3	1	4
43			2	5			1	3	43								
41			2	5			1	3	41								
39	1	3	1	3	1	3			39	1	2	1	3			1	4
37			1	3	1	3	1	3	37	1	2			1	3	1	4
35	2	5					1	3	35			1	3				
33									33	2	6	1	3	1	3		
31									31	1	2	1	3				
29	1	3			1	3			29	1	2						
27									27								
26—	3	9	2	5					26—	3	9	1	3				
	36	101	36	100	36	102	33	102		37	99	36	102	32	101	28	103

No. Wks.	Highest 10 Per Cent Mental								No. Wks.	Lowest 10 Per Cent Mental							
	First Year		Second Year		Third Year		Fourth Year			First Year		Second Year		Third Year		Fourth Year	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent		No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
52	25	68	21	57	26	70	25	74	52	17	46	26	72	21	68	16	57
51	2	5	4	11	2	5	1	3	51	5	14	2	5	2	6	1	3
49	2	5	4	11	1	3	1	3	49	2	5			2	6	1	3
47	2	5	2	5					47	2	5	1	3	2	6	1	3
45	2	5			3	9			45					2	6	1	3
43			4	11	1	3	1	3	43	2	5	1	3			2	7
41	1	3			1	3	1	3	41							3	11
39									39	3	9	1	3			1	3
37					1	3			37								
35			1	3			2	6	35	1	2	1	3	1	4	1	3
33									33			1	3	1	4		
31	1	3							31								
29			1	3					29	1	2					1	3
27	1	3					1	3	27								
26—	1	3			2	5	2	6	26—	4	11	3	8				
	37	100	37	101	37	101	34	101		37	99	36	100	31	100	28	96

TABLE 619

AVERAGE NUMBER OF WEEKS EMPLOYED

Boys

Highest Physical

	First Year	Second Year	Third Year	Fourth Year
Weeks	49.5	49.3	50.1	50.9

Lowest Physical

	First Year	Second Year	Third Year	Fourth Year
Weeks	47.3	49.5	49.3	50.1

Highest Mental

	First Year	Second Year	Third Year	Fourth Year
Weeks	49.5	49.2	50.3	49.4

Lowest Mental

	First Year	Second Year	Third Year	Fourth Year
Weeks	48.4	50.5	49.8	47.7

TABLE 620

NUMBER OF POSITIONS HELD EACH YEAR

Boys

Highest 10 Per Cent Physical									Lowest 10 Per Cent Physical								
No. of Pos.	First Year		Second Year		Third Year		Fourth Year		No. of Pos.	First Year		Second Year		Third Year		Fourth Year	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent		No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1	14	38	17	46	22	61	20	63	1	16	43	14	39	16	50	19	68
2	13	35	9	24	9	25	10	31	2	8	22	15	42	6	18	6	22
3	6	16	6	16	5	14	1	3	3	6	16	3	8	8	25	1	4
4	2	5	4	12					4	4	11	3	8			2	7
5			1	3			1	3	5	3	8	1	3	2	6		
6	1	3															
7	1	3															
	37	100	37	101	36	100	32	100		37	100	36	100	32	99	28	101
Av.	2.1		2.0		1.5		1.5		Av.	2.2		1.9		1.9		1.5	

TABLE 620—*Continued*

Highest 10 Per Cent Mental									Lowest 10 Per Cent Mental								
No. of Pos.	First Year		Second Year		Third Year		Fourth Year		No. of Pos.	First Year		Second Year		Third Year		Fourth Year	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent		No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1	14	38	13	35	21	57	18	53	1	17	46	21	60	17	55	15	54
2	17	46	10	27	8	22	10	29	2	10	27	10	29	8	26	9	32
3	5	14	9	24	6	17	4	12	3	7	19			5	16	4	14
4	1	3	4	11	1	2	2	6	4	1	3	3	9	1	3		
5			1	3	1	2			5	1	3	1	3				
									6	1	3						
	37	101	37	100	37	100	34	100		37	101	35	101	31	100	28	100
Av.	1.8		2.2		1.7		1.7		Av.	1.7		1.7		1.7		1.6	

TABLE 621

AVERAGE NUMBER OF POSITIONS HELD EACH YEAR

Boys

HIGHEST PHYSICAL

Year	First Year	Second Year	Third Year	Fourth Year
Av. No. Pos.	2.1	2.0	1.5	1.5

LOWEST PHYSICAL

Year	First Year	Second Year	Third Year	Fourth Year
Av. No. Pos.	2.2	1.9	1.9	1.5

HIGHEST MENTAL

Year	First Year	Second Year	Third Year	Fourth Year
Av. No. Pos.	1.8	2.2	1.7	1.7

LOWEST MENTAL

Year	First Year	Second Year	Third Year	Fourth Year
Av. No. Pos.	1.7	1.7	1.7	1.6
Average of total boys	2.2	1.9	1.7	1.5

TABLE 622 — NUMBER OF WEEKS EMPLOYED

Girls

Highest 10 Per Cent Physical									Lowest 10 Per Cent Physical								
No. of Wks.	First Year		Second Year		Third Year		Fourth Year		No. of Wks.	First Year		Second Year		Third Year		Fourth Year	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent		No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
52	8	30	14	59	16	70	10	50	52	19	68	19	68	19	76	16	73
51	3	11					1	5	51			3	11	2	8	1	5
49			2	8	2	9	1	5	49	4	14					2	9
47	3	11			1	4	1	5	47	1	4	1	4	1	4		
45			1	4			1	5	45			1	4				
43	2	7							43			1	4			1	5
41									41			2	7				
39	2	7	1	4	1	4	1	5	39	1	4						
37					1	4			37								
35	2	7			2	9	2	10	35								
33									33	2	7						
31	2	7	1	4					31			1	4			1	5
29	1	4	2	8			2	10	29								
27									27					2	8		
26–	4	15	3	12			1	5	26–	1	4			1	4	1	5
Av.	27	99	24	99	23	100	20	100	Av.	28	101	28	102	25	100	22	102

Highest 10 Per Cent Mental									Lowest 10 Per Cent Mental								
No. of Wks.	First Year		Second Year		Third Year		Fourth Year		No. of Wks.	First Year		Second Year		Third Year		Fourth Year	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent		No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
52	13	46	12	48	20	80	15	64	52	14	48	16	64	15	65	19	86
51	3	11	2	8	1	4	1	5	51	1	4	2	8	2	9		
49	1	4	4	16			2	9	49	3	11			3	12	1	4
47	1	4							47	1	4						
45			1	4	2	8			45			2	8	1	4	1	4
43									43			1	4				
41			3	12					41			1	4				
39	1	4							39	1	4	1	4	1	4		
37									37								
35							1	5	35								
33	1	4	1	4					33	2	7						
31	3	11	1	4					31	1	4						
29					1	4	1	5	29			1	4	1	4		
27	1	4							27	2	7						
26–	4	14	1	4	1	4	2	9	26–	4	14	1	4			1	4
Av.	28	102	25	100	25	100	22	97	Av.	29	103	25	100	23	98	22	98

that boys who are superior, either on a physical or on a mental rating, have a very slight advantage in terms of the proportion of the year during which they are employed.

Another method of estimating regularity of employment is by means of the number of positions held during a year. The details on this point for the four groups of boys are presented in Table 620. All four groups show that from 40 to 70 per cent of the boys hold but one position a year. They also show the tendency for a larger proportion of boys to hold but one position with successive years. After the second year, every group has half or more of its members holding but one position a year. No contrasts between the pairs of extreme groups appear. To obtain a single measure of the number of positions held, the average number of positions per year was figured out and is presented in Table 621.

A comparison of the two physical extremes shows no differences of which one could be confident. When the total number of positions for the four years is summed up for each group (see Table 627) it appears that the boys who are physically inferior hold a few more positions than the superior. The two mental extremes show in the present table a tendency for the superior to hold more positions a year than the inferior. This fact is con-

TABLE 623

AVERAGE NUMBER OF WEEKS EMPLOYED

Girls

HIGHEST PHYSICAL

YEAR	First Year	Second Year	Third Year	Fourth Year
Av. No. Pos.	45.0	47.6	48.7	46.3

LOWEST PHYSICAL

YEAR	First Year	Second Year	Third Year	Fourth Year
Av. No. Pos.	49.5	49.6	49.6	50.2

HIGHEST MENTAL

YEAR	First Year	Second Year	Third Year	Fourth Year
Av. No. Pos.	44.0	48.1	50.4	49.7

LOWEST MENTAL

YEAR	First Year	Second Year	Third Year	Fourth Year
Av. No. Pos.	45.3	49.0	49.8	51.5

firmed when the total number of positions for the four years is noted (see Table 627).

The details with regard to the number of weeks per year that girls were employed are presented in Table 622. Like the boys, the girls show comparatively little unemployment throughout the four years. Except for one instance, each group each year had from 45 to 85 per cent of its number employed throughout the year. The table also shows a larger proportion of girls employed throughout the year in the third and fourth than in the first and second years. When the detailed table is summed up in terms of the average number of weeks employed each year by each group (Table

TABLE 624

NUMBER OF POSITIONS HELD EACH YEAR

Girls

Highest 10 Per Cent Physical									Lowest 10 Per Cent Physical								
No. of Pos.	First Year		Second Year		Third Year		Fourth Year		No. of Pos.	First Year		Second Year		Third Year		Fourth Year	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent		No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1	8	30	18	75	15	68	15	75	1	19	66	16	57	19	76	17	77
2	8	30	4	17	5	23	4	20	2	5	17	9	31	3	12	5	23
3	8	30	2	9	2	9	1	5	3	4	14	2	7	3	12		
4	1	3							4	1	3	1	4				
5	1	3							5								
6	1	3							6								
	27	99	24	101	22	100	20	100		29	100	28	99	25	100	22	100
Av.	2.3		1.3		1.4		1.3		Av.	1.6		1.6		1.4		1.2	

Highest 10 Per Cent Mental									Lowest 10 Per Cent Mental								
No. of Pos.	First Year		Second Year		Third Year		Fourth Year		No. of Pos.	First Year		Second Year		Third Year		Fourth Year	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent		No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1	13	46	14	56	19	76	18	82	1	14	48	11	44	14	61	16	73
2	9	32	7	28	4	16	3	14	2	8	28	11	44	4	18	6	27
3	4	14	3	12	2	8	1	4	3	3	10	3	12	5	22		
4	2	7	1	4					4	4	14						
	28	99	25	100	25	100	22	100		29	100	25	100	23	101	22	100
Av.	1.8		1.6		1.3		1.2		Av.	1.9		1.7		1.6		1.3	

623), a consistent trend appears for the girls in the lowest groups, both physically and mentally, to be employed more weeks than those of the highest groups.

In the case of physical rating, the lowest group is employed 4.5 more weeks the first year, 2 more weeks the second year, 1 more week the third year, and 4 more weeks the fourth year. In the case of the mental extremes, the advantage of the lowest group is not more than two weeks in any year. The third year the highest group is a fraction of a week ahead.

The number of positions held by each group of girls each year is shown in detail in Table 624. The table shows that in all but one or two of the year's records from 45 to 80 per cent of the girls held but one position a year. It also shows a larger proportion of them holding but one position a year in the third and fourth than in the first and second years. It does not, however, show clear differences between the pairs of extreme groups. When the table is reduced to average number of positions held during the year (Table 625), the difference between the physical extremes is inconsistent from year to year. The suggestion is that the girls of the highest group hold more positions than those of the lowest. When the positions for the four years are summed up (see Table 630) this difference is clearly shown. The difference between the two mental extremes is in the reverse direction (Table 625). The girls of the lowest group mentally hold more positions than those of the highest a fact which is confirmed by the table giving the total number of positions for the four years (Table 630).

SUMMARY OF REGULARITY OF EMPLOYMENT

To facilitate the summary of these complex factors, a table (Table 626) has been made out in which, by the use of plus and minus signs, is shown which of each pair was superior and which inferior in terms of number of weeks employed and in terms of number of positions held. The summary shows that superior boys have an advantage in that they are employed a greater number of weeks than the inferior, but while the physically superior have attained this advantage by holding their positions a longer time, the mentally superior have maintained it by securing more positions.

It is interesting to note that in the case of the girls, all the facts are reversed. The inferior girls have an advantage in terms of number of weeks employed, but while the physically inferior have attained the advantage by holding their positions a longer time, the mentally inferior have obtained it by securing more positions.

TABLE 625

AVERAGE NUMBER OF POSITIONS HELD EACH YEAR

Girls

HIGHEST PHYSICAL

YEAR	First Year	Second Year	Third Year	Fourth Year
Av. No. Pos.	2.3	1.3	1.4	1.3

LOWEST PHYSICAL

YEAR	First Year	Second Year	Third Year	Fourth Year
Av. No. Pos.	1.6	1.6	1.4	1.2

HIGHEST MENTAL

YEAR	First Year	Second Year	Third Year	Fourth Year
Av. No. Pos.	1.8	1.6	1.3	1.2

LOWEST MENTAL

YEAR	First Year	Second Year	Third Year	Fourth Year
Av. No. Pos.	1.9	1.7	1.6	1.3
Average of total girls	2.0	1.6	1.4	1.3

TABLE 626

DIRECTION OF DIFFERENCE BETWEEN EXTREME GROUPS IN NUMBER OF WEEKS EMPLOYED AND IN NUMBER OF POSITIONS HELD

Boys

GROUPS	No. Weeks Employed	No. Positions Held
Highest physical	+	−
Lowest physical	−	+
Highest mental	+	+
Lowest mental	−	−

Girls

GROUPS	No. Weeks Employed	No. Positions Held
Highest physical	−	+
Lowest physical	+	−
Highest mental	−	−
Lowest mental	+	+

KINDS OF WORK DONE BY THE EXTREME GROUPS

So far, our examination of the extreme groups—the highest and lowest, mental and physical—have given us little beyond the information yielded by the original correlations. The study has enabled us to interpret the correlations a little more concretely. It has not, however, advanced us much in our quest for an explanation as to why the correlations of measures of ability with earning capacity or regularity of employment are so small, or why the relationship should be, on the whole, a positive one for boys and a negative one for girls. There is one exceedingly important phase of industrial life which cannot be treated by the correlation method and that is the kind of work performed. The study of the extreme groups offers an opportunity of investigating the relationship between grade of ability and kind of work performed. Such an undertaking will constitute the next step in this study.

The classification of kinds of work has been made both in terms of the total number of kinds of jobs for each group and the total number of individuals holding the jobs. The length of time positions were held has not been taken into consideration in this first classification. The results for the four groups of boys are presented in Table 627.

The table shows about the same total number of positions held by the upper and lower 10 per cent physically. If all of the four years of industrial records were complete for each of the 37 boys, the table would represent 148 years of industrial records. However, in each group some individuals were lost track of during the last year or two, so that each group lacks certain years' records. The heading, *Years Records Lost,* shows how many years records were missing in each case, and, in parentheses, what percentage that was of the total 148 years. The heading, *Estimated Total,* gives the estimated number of jobs for the group, assuming that the number of positions during the lost years would have been proportionate to those of the known years.

Adopting the estimated number of positions as a basis of comparison, it is evident that the boys of the lowest 10 per cent physically displayed a somewhat greater tendency to shift about than the boys of the highest 10 per cent. The difference constitutes 5 per cent of the total number of positions. In the case of the boys of the highest and lowest 10 per cent mentally, the reverse is true. The boys of the highest 10 per cent shifted position more than those of the lowest 10 per cent. The difference constitutes about 6 per cent of the total number of positions. This summary for the four years corresponds with the trends noticed in the table of number of positions held each year (Table 620).

The kinds of work done is the next point to be considered. The boys of the highest and lowest groups physically are about equally employed in factory work. It constitutes 45 per cent of the total number of positions

TABLE 627 — KINDS OF WORK DONE

Boys

First Four Years

HIGHEST 10 PER CENT — PHYSICAL TESTS (P. AV. 72)

	Errands	Fact.	Store Helper	Office Helper	Clerical Work	Print.	Delivery Wagon Boy	Stock Keeper	Shipping Clerk	Sales	Driver	Misc.	Total	Years Records Lost	Estimated Total
No. Pos. . . .	28	82	13	7	13	1	4	5	1	2	4	27	187	6	193
No. Ind. . . .	17	24	10	6	9	1	4	5	1	2	3	15		(4%)	
M. Av.	58.2	56.5	61.7	58.2	67.4		52.0	55.0	56.	48.	56.		58.5		

LOWEST 10 PER CENT — PHYSICAL TESTS (P. AV. 23)

	Errands	Fact.	Store Helper	Office Helper	Clerical Work	Print.	Delivery Wagon Boy	Stock Keeper	Shipping Clerk	Sales	Driver	Misc.	Total	Years Records Lost	Estimated Total
No. Pos. . . .	46	83	14	1	0	4	11	3	1	0	7	18	188	14	202
No. Ind. . . .	21	30	12	1	0	2	8	3	1	0	3	13		(9%)	
M. Av.	39.3	39.7	37.1	34.		43.5	41.4	43.6	45.		40.6		39.0		

HIGHEST 10 PER CENT — MENTAL TESTS (M. AV. 71)

	Errands	Fact.	Store Helper	Office Helper	Clerical Work	Print.	Delivery Wagon Boy	Stock Keeper	Shipping Clerk	Sales	Driver	Misc.	Total	Years Records Lost	Estimated Total
No. Pos. . . .	34	58	14	12	31	1	3	4	4	3	0	15	179	5	184
No. Ind. . . .	22	18	9	8	21	1	3	3	4	3	0			(3%)	
P. Av.	56.3	57.1	62.6	50.2	57.8	67.0	58.6	49.6	41.0	50.3			57.5		

LOWEST 10 PER CENT — MENTAL TESTS (M. AV. 26)

	Errands	Fact.	Store Helper	Office Helper	Clerical Work	Print.	Delivery Wagon Boy	Stock Keeper	Shipping Clerk	Sales	Driver	Misc.	Total	Years Records Lost	Estimated Total
No. Pos. . . .	43	67	5	2	2	2	4	3	6	2	3	22	161	12	173
No. Ind. . . .	20	25	4	1	2	2	4	3	4	2	3			(7%)	
P. Av.	42.0	39.9	26.8	53.0	38.0	52.5	42.0	41.3	42.2	28.5	30.		38.7		

for the four years for both groups. In the lowest group, these positions represent a greater number of individuals. Of the thirty-seven lowest boys, thirty at some time held factory positions, while of the thirty-seven highest boys, twenty-four were at some time employed in factories. More of the lowest than of the highest 10 per cent held errand-boy jobs. In the lowest group twenty-one individuals held forty-six errand-boy jobs, while in the highest group seventeen individuals held twenty-eight jobs. About equal numbers of the two groups acted as helpers in stores, but far more of the upper than of the lower group acted as office helpers or held clerical positions. Twenty office positions were held by the boys of the upper group, and only one by boys of the lower group. The other groups are all small. The lowest 10 per cent contains more wagon boys and drivers than the highest, while the highest 10 per cent contains the only boys who held sales positions, but these were cases in which an errand boy was allowed to help at times with sales.

The classification we are discussing is based upon physical records only. The same boys, of course, had mental records. Mental records have been shown to have a positive correlation with physical records of about .40 (see Table 568). We must assume, therefore, that the boys in the highest 10 per cent group on the basis of physical tests also had higher mental records than those of the lowest physical group. To determine the relationship of the mental records of these same boys to their physical records, the mental averages of the extreme groups in physical tests were summed up and are added to the table of kinds of work done. The highest 10 per cent physically had mental averages which ranged from 43 to 81, with a group average of 58.5. The lowest 10 per cent in physical tests had mental averages which ranged from 27 to 51, with an average of 39.0. Thus the group of boys selected on the ground of physical ability, with an average of percentile ranks 49 points above that of the group selected on the ground of physical inferiority, also proved to have an average of percentile ranks in mental ability which was 20 points above that of the inferior group physically.

When the various kinds of work performed by boys of the highest 10 per cent physically are studied with reference to mental averages, we find that most of the groups fall between 55 and 60. Boys who ran errands are scattered throughout the entire range of mental averages from 45 to 81. The average for the group is the same as that of the general average —58. The factory workers range from 43 to 77, with an average of 56.5. Helpers in stores vary from 45 to 77, with an average of 61.7. Office helpers, who are for the most part errand boys attached to offices, have the same mental average as the entire group —58. The clerical workers contained one individual with a mental average of 45. Aside from this instance they range from 57 to 81, with an average of 67.4. Delivery boys and drivers have been grouped together. They range from 45 to 67, with an average of 53.7. The two recorded as salesmen proved to be errand boys who were allowed to help with sales at times. They ranked 49 and 47 in mental average. The stock keepers—except for one who ranked 81—belonged in the range from 43 to 52. The one very high record brings up their average to 55.

These observations indicate that boys who held clerical positions were a highly selected group. Of the nine boys of this group, six were found also in the highest 10 per cent mentally. The errand- and office-boy groups were not selected but represented about the average and the distribution of the whole. Boys of all grades hold these positions during their early wage-earning years. The factory group also had a wide range, but tends to be selected from the somewhat inferior mentally, with an average slightly below that of the errand boys. Delivery boys and drivers represent the poorest group mentally of any. The stock keepers, with one exception, also rank well down in this series.

When we turn to a consideration of the mental averages of the 10 per cent of boys who rank lowest in physical tests, the whole range of values is, as we have seen, dropped 20 points on the scale. The values of the mental averages for this group range from 27 to 51, with a group average of 39. The two sets of values, therefore, overlap only between 43 and 51. When averaged separately for kinds of work done, slight variations only appear. The lowest occupation mentally is store helpers, with an average of 37.1, and the highest stock keepers, with an average of 43.6. Errand boys and factory workers have the same average—39.3 and 39.7. Delivery boys and drivers are somewhat better, with an average of 41. There are no clerical workers in this group, and but one stray office boy, with a rank of 34. There were but two boys employed in the printing trade, and they had mental averages of 42 and 45.

Our general conclusion is that clerical work is not found at all in the group which ranks poorest in physical tests, but is an important occupation for the group which ranks best physically. However, the indication is that the basis of selection is not primarily physical, but mental—an indication that is confirmed when the two extreme groups mentally are studied. Errand boys and factory workers are found scattered throughout both groups. Little selection on the basis of ability is indicated. Delivery and wagon boys, and stock keepers are found in both groups. They rank mentally toward the lower end of the top physical group and toward the upper end of the bottom physical group, which suggests that these occupations are suited to a middle grade of mental ability. It remains to be seen whether differences will appear when a finer analysis of the exact kind of work is undertaken.

The next point to consider is the kinds of work performed by the highest and lowest 10 per cent of boys mentally. Errand-boy positions are of about the same frequency in the two extreme groups mentally as they were in the two extreme groups physically. Twenty-one of the highest group held thirty-four errand-boy positions, and twenty of the lowest group held forty-three positions. Factory work in this case also constitutes the largest single occupation. Of the thirty-seven boys in the highest 10 per cent mentally, eighteen held fifty-eight factory jobs; while of those in the lowest group, twenty-five held sixty-seven jobs. For the highest 10 per cent mentally, factory jobs thus constituted 33 per cent of the total number of positions, while for the lowest 10 per cent they constituted 41 per cent. The proportion of factory workers for the two physical extremes was 45 per cent. It is significant that the highest 10 per cent mentally have a smaller proportion of factory work than the other three groups. Helpers in stores are found about as frequently in the highest 10 per cent mentally as in the two physical extremes, but the group is small for the lowest 10 per cent mentally. Office helpers and clerical workers are much more frequent in the highest 10 per cent mentally than in any other of the four groups. Of the thirty-seven boys, eight held twelve positions as office helpers, and twenty-one held thirty-one positions in clerical work. In the lowest 10 per cent mentally, there are three recorded as holding office or clerical positions. Delivery boys and drivers are more frequent among the lowest than among the highest group mentally. Shipping clerks are found equally in the two extreme groups mentally and are more frequent among them than among the physical extremes. There were but two shipping clerks in the physical extremes, while there are eight in the mental extremes —a fact which suggests that a median grade of physical ability is probably the chief requirement.

The average in physical tests for the two extreme groups mentally is 57.5 for the highest group and 38.7 for the lowest group. It is interesting to note that the mental averages of the extreme physical groups are about the same as the physical averages of the extreme mental groups. The physical averages of the two mental groups seem to bear no consistent relation to occupation (see Table 627). The trend of the two sections of the table indicates that in so far as choice of work bears any relation to the mental or physical level of the individual, it is the mental rather than the physical ability which is influential.

So far our study of the kinds of work performed seems to indicate that there is little selection, either on a physical or on a mental basis, except that those with a high mental rating are selected for clerical or office positions and are found less frequently in factories. Errands and factory work are stock occupations for the group no matter what the mental or physical status, though factory work is somewhat less frequent among the very superior mentally. Wagon boys and drivers are infrequent among those who rate high mentally, but are found in all the other groups. Stock keepers are scattered impartially through the four groups. Shipping clerks seem to be drawn from those of moderate physical ability, but without much reference to mental ability.

Since the group of factory workers was so large in every classification, it seemed worth while to try to analyze further the exact kinds of work performed to see if they bore any relation to mental or physical ability. The factory positions of the boys were classified first under the headings: shoe factory, wood-working trades, metal-working trades, and miscellaneous.

The results of this classification for the four extreme groups of boys is presented in Table 628. The chief difference which appears between the two physical extremes is that the superior group has a larger proportion in the metal-working trades (38 per cent as against 29 per cent), and the inferior group a larger proportion in miscellaneous factory jobs (31 per cent as against 20 per cent). The proportions of the two found in shoe factories (37 per cent and 33 per cent) and the proportion in wood-working trades (6 per cent and 7 per cent) were very similar. As a final step in the comparison of the two physical extremes, the exact kind of work performed by the two groups in each case was studied. The two groups of shoe factory workers show the following differences. Among the boys of the superior groups were two who succeeded in the cutting room—the most skilled and aristocratic department of the shoe factory. One of these boys stayed four years in the cutting room and was well on his way to be a skilled cutter. This boy belonged also in the highest group mentally. The second boy spent two years in the cutting room. In the inferior group was one boy who was tried in the cutting room for a year, and then demoted to be a last-boy. Of the twenty-seven positions in shoe factories held by boys of the lowest 10 per cent physically, sixteen were simple hand jobs, such as odd-shoe boy, inker, tack puller, wetter-up, last-boy, or buttoner and lacer. Of the thirty in the highest group, nine positions were of this class. The highest group, on the other hand, held a greater variety of miscellaneous jobs

TABLE 628

CLASSIFICATION OF FACTORY WORK PERFORMED BY BOYS DURING THEIR FIRST FOUR YEARS IN INDUSTRY

Group	Shoe Factory		Wood-Working Factories		Metal-Trades Factories		Miscellaneous		Total
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	
Highest physical . .	30	37	5	6	31	38	16	20	82
Lowest physical . .	27	33	6	7	24	29	26	31	83
Highest mental . . .	19	33	2	3	18	31	19	33	58
Lowest mental . . .	21	31	7	10	10	15	29	43	67

somewhat better in type, such as breaster, turning channels, preparing work for stitching, boxing and shipping shoes, assorting and getting out lasts. None of the boys in the highest group held the simplest types of hand work as long as a year, while in the lowest group there were two who spent two years inking edges and soles, one who spent three years pulling tacks, one who spent two years as an odd-shoe boy, one who spent a year as a last puller, and one who spent a year inking edges.

Aside from the fact that more boys of the highest 10 per cent obtained positions in the metal trades, there is comparatively little difference in their records. A few more of the superior were given work with machines, but the positions were, on the whole, of short duration for both groups. Only six in each group held their jobs as long as a year, and only two superior boys and no inferior ones for two years.

The miscellaneous factory jobs, too, show a little difference in type between the superior and inferior groups. Six in each case were employed in operating various types of machines—a larger proportion of the superior than of the inferior group. Six of the inferior and three of the superior were employed in various jobs connected with printing. The three for the superior boys were all press-feeding jobs. Two of the inferior ones were press feeding and the others were bronzer, fly boy, straightening sheets, and learning printing (for a very short time!). For the rest, general utility and packing jobs are found in both groups. Cleaning lamps, cleaning glass, and sorting laundry bundles are jobs found among the inferior only.

The groups of mental extremes show greater differences in kind of factory work done than the groups of physical extremes (see Table 628). The superior mentally have 31 per cent of their number in metal-working trades, while the inferior have but 15 per cent. The inferior mentally have the largest proportion of miscellaneous jobs of any—43 per cent. The superior mentally have but 33 per cent. The inferior have 10 per cent in wood-working factories, while the superior have but 3 per cent.

The careers of the two extreme mental groups, when analyzed for exact kinds of work performed and for length of stay, show further differences. Of the nineteen positions held by mentally superior boys in shoe factories, three were on machines, one was in the cutting room, one was turning channels, and one was learning skiving. Not one boy of the inferior group was given charge of a machine, nor was a single one turning channels or learning skiving. The work performed by the inferior group was routine hand work such as inking edges, wetting-up, pulling tacks, beating out welts, or last-boy. The length of time that positions in shoe factories were held is also significant. The superior boys, except the one who was four years in the cutting room and thus well on his way to the best paid and most aristocratic job in the factory, held their places a shorter time than the inferior ones. Of the nineteen positions held by superior boys, fourteen were held less than a year. One boy who was on a machine, feeding heels, held the job a year and a half. One odd-shoe boy and one boy who turned channels held the jobs for a year. In one position, held for a year, the exact kind of work is not specified. Among the boys of the mentally inferior group, one spent three years as an edge inker and last puller; one spent three years as a stitching cleaner; one spent two years beating out welts; one spent two years wetting up and pulling tacks; one spent one year in the cutting room, but did not succeed and was demoted to be a last-boy; one spent one year as a wetter-up and getting out work; one spent one year as a tacker; one spent one year in inking edges; and one spent one year as a helper in the lasting room.

The situation in the metal trades shows the superior boys getting the better jobs and holding them longer. The inferior, except for the few positions in simple handwork, do not stay long in metal trades. Of the eighteen positions in metal trades for the superior boys, five were for a year or more, and three of these were on machines—one in press feeding, one in operating a drill press, and one on a finishing lathe. The other two were moulding for a casting company and brass-wrapping. Of the shorter jobs held by the superior boys, four were on presses or lathes, one was riveting, one was galvanizing, one was core-making, and three were on tin work. Of the ten jobs held by inferior boys, one was for two years in wrapping valves, and one for one year in moulding. Of the eight short-time jobs for inferior boys, six were on machines and two in simple handwork.

The two mentally superior boys in the wood-working trades were employed a few months each in catching behind a saw. The seven jobs for inferior ones were all of short duration, and except for one in machine work, were simple hand jobs in bench work, sandpapering, etc.

The miscellaneous factory positions of the two extreme groups in mental ability are hard to compare, but even these casual occupations show a tendency to give the superior kind of work to the superior boys. Of the nineteen miscellaneous factory jobs for superior boys, there were six in machine operating, three in packing goods (soap, thermos bottles, and underwear), two piano factory jobs (filing hammers and polishing), one in carbon measuring for a battery company, one inspecting cells for a battery company, one making points for a fountain pen company, one general assembling in a lamp company, and two in tailor shops, one in a tin shop, and one in plating.

Of the twenty-nine miscellaneous factory jobs of the mentally inferior boys, five were on machines, four were in glass factories in cleaning glass and helping, five were in packing goods (candy, bottles, leather goods, and shirts), seven at a variety of simple hand jobs in various factories, one carrying cases at the abattoir, one cutting and trimming leather, one moulding batteries, one bottle washer, one sorting bundles in a laundry, one learning cutting with a tailor (but he held five other jobs the same year!), one assistant in the car-repairing department of a railroad, and one helping to mix pie for a pie company.

Of the twenty-seven miscellaneous occupations of the boys who were physically superior, thirteen were in connection with trades, as follows: three were connected with butchering—pork butcher, butcher's apprentice and cattle-killer, all held by the same boy; one was in upholstering; three were in paper hanging for an interior decorator—all held by the same boy; two were helper and apprentice to an electrician—both held by the same boy; one was a locksmith's apprentice; one was a position in drafting in a blue-print room; one was an engineer on a river steamer; and one was a plumber and gas-fitter's assistant. The other fourteen positions were as follows: one collector and messenger for the telegraph company; one jockey at the race course; one elevator boy; two jobs as bartender in a saloon—both held by the same boy; one bottle-filler in a wine house; one cooker of fruit for a pie company; two jobs in a theater as assistant to the property man—both held by the same boy; two jobs as helper at a hot-tamale stand—both held by the same boy; one general utility job; one helper for an advertising company; and one boy in the House of Refuge for delinquency.

Among the eighteen miscellaneous jobs of the boys in the inferior group physically, only three were in connection with trades: one pharmacy clerk; one helper to a horse-shoer; and one assistant to a carpenter and contractor. The others were as follows: three general utility jobs; two positions as bell-hops in hotels; one paint-mixer who was also office boy; one laborer in railroad shops; one washer of bottles in a brewery; one job in the corking department of a brewery; one oiler for an ice company; one helper in a laundry; two boys who went on hoboing trips; and one in the House of Refuge for delinquency.

The superiority of the kinds of miscellaneous work done by the physically superior boys is very evident. Perhaps it is not fair to class hoboing and residence in the House of Refuge as "jobs" but they are certainly occupations which should be noted.

Turning now to the miscellaneous occupations of the two mental extremes, we find that of the fifteen miscellaneous jobs of the mentally superior boys, nine were in connection with trades or professions, listed as follows: one was a surveyor's assistant; one was learning house painting; one was a paper hanger's apprentice; one was a plumber's apprentice; one was a locksmith's apprentice; one was learning the tinning trade; one was pressing for a tailor; and two jobs—held by the same boy—were as helper in a chemical laboratory. The other six occupations were: one cook on a railroad; one head mangle-hand in a laundry; one florist's helper; one helper to an advertising company; one general utility boy; and one attending business college.

TABLE 629

POSITIONS HELD AT THE END OF FOUR YEARS OF EMPLOYMENT *

Boys

Highest 10 Per Cent Physical	Lowest 10 Per Cent Physical
Office Work (2) Filing clerk—life ins. company (3) Office clerk—asbestos company (4) Office work—railroad company (1) Filing clerk—gen. elec. company (5) Time-keeper—abattoir Order clerk—candy company	Shipping clerk—music company
6	1
Stock Keepers Tailor Wholesale drug company Florist (6) Electric supply company	
4	0
Trades Paper hanger Electrician's apprentice (7) Locksmith's apprentice Engineer—river steamer (8) Cutter—shoe factory Butcher—killing cattle Upholstery Machinists' apprentice *2*	Pharmacy clerk Learning printing
9	2
Machine Operating and Factory Work (9) Finishing lather Lathe hand Machine hand-furniture factory Job press Heating rivets Polishing watch cases Assembling motor parts *Shoe factory jobs 3* All round man and assorter Shipping room hand Breaster	Lathe hand *4* Shaper Vise hand Hand press—embossing Running a card cutter (10) Punching machine—lamp company (11) Nickel plating Foundry hand Tool-boy for a machinist (12) Moulding batteries *Shoe factory jobs 7* (13) Last puller Sewing lasts Rubbing down channels Odd-shoe boy Breast sander Pulling tacks Inking soles
10	20

TABLE 629—*Continued*

Boys

HIGHEST 10 PER CENT PHYSICAL			LOWEST 10 PER CENT PHYSICAL
Driver or Chauffeur			
Furniture company Ice wagon Pie wagon	3	2	(4) Department store Private family
General Utility and Odd Jobs			
	0	1	(15) Brass works
Messenger or Delivery Boy			
	0	2	(16) Messenger and wrapper—department store Delivery boy—cake shop
Miscellaneous			
Bartender Helping in a fruit store Assistant to property man in theater Collector and messenger for telegraph company	4	6	Hobo Bronzer and press-feeder Washing bottles—brewery House of refuge Auto-repair shop helper Oiler for the ice company
Omitted (*lost track of for 2 years*)	1	3	
Total	37	37	

* Duplicate positions in different groups have been indicated by number in parentheses.

Of the twenty-two miscellaneous occupations of boys of the mentally inferior group, only five could be classed as connected with trades: two apprentices to machinists; two learners in the tailoring trade (pressing and cutting); and one employee of the secret service. Two of these positions were with the boys' own fathers, and the secret-service job was with an intimate friend of the father. Of the other seventeen positions, six were general utility and odd jobs; two were helping mother; one was a garden helper; one was a farm helper; one was a city laborer; one was a cook in a restaurant; one was filling orders for a truss company; one was setting up pins in a bowling alley; two were in the Navy; and one was in the House of Refuge for delinquency. The fact that the miscellaneous occupations held by the mentally superior boys were of a much better grade than those of the inferior group is evident enough.

As a final method of comparing the extreme groups, the positions held at the end of the four-year period of this study have been compared. In

TABLE 629—*Continued*

Boys

	Highest 10 Per Cent Mental	Lowest 10 Per Cent Mental
Office Work	Office clerk—gen. elec. company (1) File clerk—gen. elec. company *2* (2) File clerk—life insurance company (3) Office clerk—asbestos pipe company Office clerk—real estate company Office clerk—coffin company (4) Office work—railroad office Auditor of freight accounts—railroad company Chief entry clerk—wholesale candy co. Bookkeeper—real estate company Shipping clerk—department store *2* Order clerk—music store (5) Time keeper—abattoir Shipping clerk—engravers Stenographer—ink company Bookkeeper—chemical company 18	Assistant shipping clerk—wire screen company 1
Stock Keepers	(6) Electric supply company 1	Music store 1
Trades	Painter Paper hanger Plumber Laboratory work chemical company (7) Apprentice—locksmith (8) Cutter—shoe factory 6	Apprentice to machinist Finishing and pressing—tailor Assistant to builder and contractor 3
Machine Operating and Factory Work	Press feeder *2* Drill press operator (9) Finishing lather Lathe hand Head mangle hand Tinner Core-maker 8	(10) Punch press operator *3* Machine shop (several machines) (11) Nickel plating (12) Moulding batteries Wrapping machine—bakery Running stripper—paper box factory *Shoe factory jobs 3* (13) Last puller Shoe repairer Beating out welts 11

TABLE 629—*Continued*

Boys

HIGHEST 10 PER CENT MENTAL	LOWEST 10 PER CENT MENTAL
Driver or Chauffeur	(14) Department store Wagon helper for a fruit dealer (father) Delivering ice
0	3
General Utility or Odd Jobs Department store	Carriage company (15) Brass works
1	2
Messenger or Delivery Boy	(16) Messenger and wrapper—department store Stock boy—milliner
0	2
Salesman Gent's furnishings Department store	Father's grocery store
2	1
Miscellaneous Soliciting for a pickle company and delivering goods	Entered the Navy *2* Cook in a restaurant Telegraph clerk in a branch office Painting—candle company Filling orders—truss company Fitting windows—sash and door company Packing goods—department store
1	8
Omitted (lost track of for 2 years)	
0	5
Total 37	37

Table 629 the final positions held by the boys of the physically superior and inferior groups are classified and arranged in parallel columns. In the superior group, nineteen of the boys are classed as office workers, stock keepers, or employees of skilled trades, while only three of the inferior are found in these groups. There are ten superior and twenty inferior ones employed at machine tending or other types of factory work. The only boys in either group still employed in errand or general utility jobs are the inferior ones. Among the miscellaneous occupations was one inferior boy who had become a hobo and one who was in the House of Refuge for delinquency, while no superior boy belonged to this outcast group. None of the miscellaneous jobs held by the inferior group involved responsibility or the handling of money, while all of the miscellaneous jobs of the superior boys had this aspect. It is interesting to note that the superior boy who had drifted into the liquor trade was a bartender, while the inferior one was a bottle-washer.

The two mentally extreme groups (Table 629) show as great a contrast, though of a somewhat different type. Eighteen of the thirty-seven mentally superior boys were in office work by the end of the four years, and but one of the mentally inferior. There are more of the mentally superior boys in trades (six as against three) and fewer of them in machine operating or factory (eight as against eleven), though these contrasts are by no means so marked as the corresponding ones of the physical extremes. No mentally superior boy was a driver or chauffeur, while three mentally inferior ones were. But one mentally superior boy was in the general utility or errand-boy class, while four mentally inferior ones were in that group. No salesmen were found among the boys of the physical extremes, while two mentally superior and one mentally inferior boy were salesmen. The inferior one, however, was working in his father's grocery store, while the two superior ones were in a men's furnishing and a department store. But one superior boy is classed in the miscellaneous group, and he held a position in soliciting trade and delivering goods for a pickle company. There were eight miscellaneous jobs for the inferior, the most responsible of which was that of telegraph clerk in a branch office. Two of these boys had entered the Navy. No boy of the superior group had been lost track of, while five of the inferior group had eluded our search for two years.

SUMMARY OF THE KINDS OF WORK DONE BY BOYS

Our examination of kinds of work done has shown a much more definite relationship to mental and physical ability than did either earning capacity or regularity of employment. Since there is so definite and positive a relationship between mental and physical ability, one cannot consider the two entirely without reference to one another. However, the following trends seem clear:

I. Office workers are highly selected on the basis of mental ability and are therefore much more numerous in the group of the mentally superior than in any other. The fact that office workers are also numerous among the physically superior is due to the fact that many of the group are also mentally superior.

II. The superior trades and the better types of factory work are recruited from the physically superior who are also of good mental status.

The selection seems to be based somewhat more on physical than on mental prowess, though this may be due merely to the fact that office work has such a strong tendency to attract the mentally superior.

III. Poor mental ability is on the whole a greater handicap for boys than poor physical ability. Fewer of the lowest mental group succeed even in routine factory work. More of them drop out and are lost track of entirely. More of them are found doing miscellaneous jobs of an inferior type.

IV. Almost all of the bad failures belong in one or the other of the inferior groups. The boys who became hoboes, those who were placed in reformatories (with one exception), those who drifted away and left no trace (with one exception), those who entered the Navy—all belonged in the inferior groups. (Entering the Navy among these young boys means either industrial failure or desire to escape the consequences of some delinquency. It could be done only by falsifying their ages.)

The classification of the kinds of work done by girls is presented in Table 630. The table is to be interpreted the same way as that of the boys. Since there were 29 girls, if the four years' records had been complete, each section of the table would represent 116 years of industrial records; but because records of some years are lacking in each group, the actual number of positions recorded may not represent the group fairly. To reduce them all to the same basis, the number of years' records lost in each group is tabulated with the percentage which that number is of the total 116 years. Assuming that the number of positions held during the years whose records were lost would be proportionate to the known years, a correction has been made and the estimated number of positions entered in the table. The table shows that of the four extreme groups, the poorest 10 per cent physically shift least often and the highest 10 per cent physically most often. The two mental extremes fall between the two physical extremes in this respect. The highest group mentally shift somewhat less than the lowest, though the difference is small.

The kinds of work done by the four groups is the next point to consider. The occupations of importance are factory work, sewing, the various department-store positions, and clerical work. When one compares the two extreme physical groups, factory work proves to be the most important occupation for both. It employs 42 per cent of the superior and 52 per cent of the inferior. Sewing comes next in importance for the inferior group, and positions in stores for the superior. Sewing takes 11 per cent of the physically superior and 32 per cent of the inferior, while stores take 12 per cent of the superior and 9 per cent of the inferior. Most of the inferior ones in

TABLE 630 — KINDS OF WORK DONE

Girls

First Four Years

	Factory	Sewing	Wrapper	Sales	Inside Errands	Clerical Work	House Work	Outside Errands	Telegraph and Telephone	At Home	Misc.	Total	Years' Records Lost	Estimated Total
HIGHEST 10 PER CENT — PHYSICAL TESTS (P. Av. 72)														
No. Pos.	47	13	5	5	4	16	4	1	3	3	12	113	10	124
No. Ind.	20	8	5	4	4	8	3	1	3	3	10	29	(9%)	
M. Av.	54.2	56.1	62.2	61.8	51.2	56.2	44.3	49.0	59.7	59.0		56.0		
LOWEST 10 PER CENT — PHYSICAL TESTS (P. Av. 26)														
No. Pos.	49	30	1	2	5	0	2	1	0	1	3	94	11	103
No. Ind.	19	16	1	2	3	0	2	1	0	1		29	(9%)	
M. Av.	35.1	36.4	37.0	35.5	35.0		34.5	38.0		29.0		36.0		
HIGHEST 10 PER CENT — MENTAL TESTS (M. Av. 69)														
No. Pos.	24	28	9	5	6	14	2	1	0	4	7	100	8	108
No. Ind.	12	13	9	5	5	10	2	1	0	4	7		(7%)	
P. Av.	52.1	50.6	55.1	55.2	53.2	56.0	37.5	62.0		48.3		54.6		
LOWEST 10 PER CENT — MENTAL TESTS (M. Av. 24)														
No. Pos.	64	18	1	3	5	0	3	2	0	5	8	108	7	115
No. Ind.	24	11	1	2	4	0	2	1	0	5	6		(6%)	
P. Av.	40.3	37.1	59.0	29.0	40.0		45.5	36.0		40.8		39.8		

department stores are employed in inside errands. The greatest contrast between the two groups comes in clerical work, which constitutes 14 per cent of the positions of the superior, but none of the work of the inferior. The contrast between the two extreme physical groups is, therefore, that while the inferior have a larger proportion in factory work and in sewing, the superior have more in department-store positions and in clerical work.

The two extreme groups in physical tests which we have just compared also had mental ratings which have been entered in the table. We have seen that on the basis of physical tests the highest 10 per cent have a group average of percentile ranks which is 46 points above that of the lowest 10 per cent. We now find that the upper group also has a group average percentile rank in mental tests which is 20 points above that of the lower group. The mental averages of the highest 10 per cent physically vary from 26 to 75. In discussing results, therefore, we must bear in mind the fact that not only is the superior group ahead in the characteristic on which the classification is based—physical ability—but it is also ahead in mental ability.

The workers in the various occupations represented in the two extreme physical groups show some mental differences which are of interest. The girls acting as wrappers and salesgirls in department stores have the highest mental records of any group, with percentile averages of 62.2 and 61.8—well above the general average of 56.0. Telephone and telegraph operators are next, with a percentile average of 59.7. The clerical workers have only the same mental average as the group at large—that is, 56.2. The girls in the sewing trade also have the same average as that of the group at large, while those in factory work have an average 2 points below that of the whole group. The few girls employed in inside errands, outside errands, or housework are distinctly below the general average.

The girls of the lowest 10 per cent physically had mental percentile ranks which varied from 18 to 70, with a group average of 36.0. The separate employments show little difference in mental average. All but a scattered few of these girls were employed in factory work and sewing. Factory workers have a mental percentile rank a fraction of a point below the general average, and sewing girls one a fraction of a point above. The two girls recorded as sales women had brief careers as clerks in grocery stores—one of them a grocery store and saloon combined. None of those employed in department stores as wrappers or in inside errands were advanced to other positions. They were tried a short time and then dropped.

The comparison of the two extreme physical groups leads us to conclude that factory work and sewing are the only two occupations really open to girls of the lowest group physically, while for girls of the highest group, store positions, clerical work, and telephone or telegraph operating offer genuine possibilities in addition to factory work and sewing.

The next point to consider is the occupational differences of the girls of the highest and lowest 10 per cent mentally. The girls of the highest 10 per cent mentally have but 24 per cent of their positions in factory work, while those of the lowest 10 per cent have 60 per cent in factory work. Sewing claims 28 per cent of the highest group and but 17 per cent of the lowest group. There were 20 per cent of the highest group employed in stores, and but 8 per cent of the lowest group. Clerical work took 14 per cent of the highest group and none of the lowest.

The physical averages of those in the two extreme mental groups are also presented in the table. The differences in physical average among the various occupational groups are small and apparently of no significance. In the girls' table, as in that of the boys', what selection there is with reference to occupation seems to bear more relation to mental than to physical ability. In the case of telephone and telegraph operating a very high degree of physical ability united with a mental ability, decidedly above average, seems to be the requirement. As in the case of the boys, factory work is found less frequently among the girls of the highest 10 per cent mentally than in any other group. Factory work and sewing are, however, stock occupations for all groups. Clerical work is found only among those who are mentally and physically superior. Store positions are far more frequent among the two superior than among the two inferior groups. The latter statement is particularly true of wrappers and salesgirls. As inside messengers the stores employ some very inferior girls, who in no instance were advanced beyond this position or retained long in the store. The only salesgirls in the two inferior groups were in grocery stores or bakeries, while part of the superior ones were in the large department stores.

The kinds of factory work performed by the four extreme groups of girls are summed up in Table 631. Shoe factories constitute about half of the number of positions for each group. Only those of high physical rating are found in soap factories. Paper box factories employ all groups, but the inferior—mentally and physically—predominate in numbers. Candy factories also employ all kinds, but those of high mental rating are rare. Gum and hosiery factories are represented by the two inferior groups only. The flag manufacturing company has only those of high physical rating, since the two positions listed in the group of the poorest 10 per cent mentally were held by a girl who also ranked in the highest 10 per cent physically.

The only group of factory workers large enough to be worth further analysis is that in shoe factories. The kinds of work performed in shoe factories by the four groups does not differ in any significant fashion. All of them do cementing, stay-pasting, lacing, tip-repairing, sewing linings, packing and cleaning, and a variety of other jobs. The difference comes out in terms of the length of time the girls remain in the factory (Table 632). The twenty-three positions of the lowest 10 per cent physically were held by ten girls. Of those seven worked in shoe factories from three to four years, and an eighth one for a year and a half. The twenty positions of the highest 10 per cent physically were held by twelve girls. Of these none remained in the shoe factory as long as three years. There were three who stayed two years, and three more who stayed from one to two years. The thirty-two positions of the lowest 10 per cent mentally were held by eighteen individuals. Of these, four stayed from three to four years, four stayed from two to three years, and three more stayed from one to two years. The eleven positions of the highest 10 per cent mentally were held by six individuals. None of these stayed in the shoe factory as long as three years. One of them stayed two years, and three of them stayed from one to two years. The inferior, both mentally and physically, are much more likely to find in the shoe factory a permanent and satisfying job than the superior. For the superior the shoe factory tends to be a temporary chance to earn money at an uncongenial job. The fact that at the end of the five-year period not one of the mentally superior group was in a shoe factory, while seven of the mentally inferior were, and that but one of the physically superior (who also belonged among the mentally inferior) was in a shoe factory, while five of the physically inferior were, is a further proof that superior girls rarely remain in shoe factories.

TABLE 631

CLASSIFICATION OF FACTORY WORK PERFORMED BY GIRLS DURING THEIR FIRST FOUR YEARS IN INDUSTRY

Group	Shoe		Soap		Paper Box		Candy		Gum		Hosiery		Flag Co.		Misc.		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Highest physical . .	20	43	9	19	6	13	4	9	0	0	0	0	3	6	5	11	47
Lowest physical . .	23	47	0	0	8	16	3	6	3	6	3	6	0	0	9	18	49
Highest mental . . .	11	46	0	0	3	13	1	4	0	0	0	0	0	0	9	38	24
Lowest mental . . .	32	50	0	0	8	13	5	8	2	3	3	5	2	3	12	19	64

TABLE 632

LENGTH OF TIME GIRLS REMAINED IN SHOE FACTORIES DURING THE FIRST FOUR YEARS

Group	4 yrs.	3 to 4 yrs.	2 to 3 yrs.	1 to 2 yrs.	Less than 1 yr.	Total
Highest physical . .	0	0	3	3	6	12
Lowest physical . .	2	5	0	1	2	10
Highest mental . . .	0	0	1	3	2	6
Lowest mental . . .	3	1	4	3	7	18

The few miscellaneous factory positions held by the four groups show no significant differences. The list is as follows:

*Miscellaneous factory positions held by girls during the first four years**

Highest Physical
(1) Packing medicines
Packing art goods
Enclosing circulars—yeast
Felting in the action department—piano factory
Sample paster—woolen company

Lowest Physical
Sorting corn—broom works
Pasting aprons—carriage company
Power-machine work—mop factory
Bunch-breaking—cigar factory
(2) Inspecting on a folding machine—bindery
(2) Wrapping cards—playing card company
(2) Covering pneumatics—piano factory
Glass cutter—glass works

Highest Mental
(1) Packing medicines
Packing sport goods
Machine operating—garter company
(2) Inspecting on a folding machine—bindery
(2) Wrapping cards—playing card company
(2) Covering pneumatics—piano factory
Roller—cigar factory
Paper-bag maker—paper-goods company
Stacker, bronzer, and gluer—paper novelty company

Lowest Mental
Machine operating—mop factory
Putting bands on cigars—cigar factory
Packing biscuits—biscuit company
Paper-bag maker—paper-bag company
Labelling and wrapping—novelty company
Folder—paper goods company
Taking ornaments out of oven—coffin company
Wrapping butter—creamery
Packing goods—sporting-goods company
Hand stamper—printing and engraving

* Positions held by the same individual in two different groups have been indicated by number.

A few points of interest appear in a study of the kinds of work done in the sewing trades by the four groups. Machine work is rarely given to the most inferior mentally. Of eighteen positions in the group, one was for machine operating in an overall factory, and two for machine sewing in tailoring shops. Of the twenty-nine positions of the superior group mentally, five were for power-machine operating in factories, and seven for machine work in tailoring shops. The inferior physically have a good proportion in machine work. Of their thirty positions two were for power-machine operating and fourteen for machine sewing in tailoring shops.

The superior group physically had but thirteen positions in the sewing trade of which one was in power-machine operating and two in machine sewing. All four groups are employed both in simple hand jobs, such as pulling bastings, sewing on tickets, basting seams, or sewing on buttons and hooks, and in the somewhat more difficult hand operations of the tailoring and dress-making shops.

The length of time that members of the four groups remained in the sewing trades is another point of interest (see Table 633). The thirteen positions of the physically superior group were held by eight individuals only one of whom remained in the trade as long as a year. None was permanent. The thirty positions of the physically inferior group were held by sixteen individuals, of whom eight stayed in the trade three or four years (five of them the full four years), two more stayed from two to three years, and six less than a year. The twenty-eight positions of the mentally superior group were held by thirteen individuals. Of these, four remained in the trade three or four years, three remained from two to three years, two remained from one to two years, and only four remained less than a year. The eighteen positions of the mentally inferior group were held by ten girls. Of these one remained four years, one remained two years, five remained from one to two years, and three remained less than a year. Stated in terms of percentages the facts are as follows. In the physically superior group no girl remained more than two years in the sewing trade, and one hundred per cent less than two years. In the physically inferior group sixty-two and a half per cent remained more than two years, and thirty-seven and a half per cent less than two years. In the mentally superior group fifty-four per cent remained more than two years, and forty-six per cent less than two years. In the mentally inferior group twenty per cent remained more than two years, and eighty per cent less than two years. The trade seems to offer little to those who are very inferior mentally, or to those who are very superior physically. A very inferior physical ability united with a moderate degree of mentality is sufficient for success, though the trade offers scope to those of superior mental ability also.

TABLE 633

LENGTH OF TIME GIRLS REMAIN IN SEWING TRADES DURING FIRST FOUR YEARS

Group	4 yrs.	3 to 4 yrs.	2 to 3 yrs.	1 to 2 yrs.	Less than 1 yr.	Total
Highest physical . .	0	0	0	1	7	8
Lowest physical . .	5	3	2	0	6	16
Highest mental . .	2	2	3	2	4	13
Lowest mental . . .	1	0	1	5	3	10

The miscellaneous occupations of the four groups of girls are so small that they can be easily listed.

Miscellaneous Occupations of the Four Groups of Girls *

Highest Physical

(1) Stock keeper, mail-order filler, and telephone operator
Department store (four years)
Business college or school (three years)
(2) Millinery—making hats (three years)
Painter of postals—art company (one and one-half years)
Assistant to a photographer (less than a year)
Married (three girls)
Hotel waitress (less than a year)

Lowest Physical

(3) Ironing collars—laundry (less than a year)
Sorting goods—tailor shop (four years)
Married (one girl)

Highest Mental

(1) Stock keeper, mail-order filler, and telephone operator department store (four years)
Business college (one year)
School (one-half year)
(2) Millinery—making hats (three years)
Millinery—apprentice and trimmer (four years)
Tying books—art company (one year)
Married (one girl)

Lowest Mental

(3) Ironing collars—laundry (less than a year)
Singing in a theater (less than a year)
Telephone operator and typist—wholesale millinery (one and one-half years)
Hand-painting—art company (two and one-half years)
Waitress—restaurant (less than a year)
Married (singing in a theater at night)
Dead

* Duplicate positions in different groups have been indicated by number.

There are a few interesting points to note about these lists. The only girls in the millinery trade belong to the two superior groups. The only girls who had returned to school or business college are found in the two superior groups. One girl, who was superior both mentally and physically, held a good position in a department store for four years. The only instance of a four-year position among the inferior girls was one for sorting goods in a tailor shop, held by a girl who was physically inferior. The girl in the lowest group mentally who held a position with a wholesale milliner as a telephone operator and typist for a year and a half was unusual in that she was physically mature, good-looking, well-dressed, and fluent in language. Her chief duty was answering the telephone, and she had a long-suffering employer. It is also interesting that while three girls in the physically superior group were married, only one in each of the others was. Perhaps general physical maturity played a part in determining the early marriage.

The final method of comparison is by means of an analysis of the positions held by the girls of the four extreme groups at the end of four years of industrial life (Table 634). In the case of the two physical extremes the chief contrast is that the inferior girls are found almost exclusively in factory work and sewing while the superior are scattered among office work, factory work, sales positions, telephone and telegraph operating, and several miscellaneous occupations. Not one inferior girl is found in office work, while seven of the superior are. There are sixteen of the inferior and but six of the superior in factories. There are eight of the inferior and but one of the superior in sewing trades. No inferior girl is found in sales work, telephone or telegraph operating, while five superior

TABLE 634 — POSITIONS HELD AT THE END OF FOUR YEARS*

Girls

Highest 10 Per Cent Physical	Lowest 10 Per Cent Physical
Office Work (2) Gen'l office work—linotype company (3) Cashier—department store (4) Mail order clerk and telephone operator—department store General office work—laundry General office work General office work—investment company (15) Cashier—grocery store	
7	0
Factory Work Wrapping soap—soap factory Wrapping soap—soap factory Packing soap—soap factory (14) Press-feeder—flag company General factory work—flag company (1) Packing medicine	Shoe factory Trimming and laying on linings Unties work Making linings Folder Vamp lining Pressing seams (8) Candy factory—packer (9) Candy factory—carrying trays (11) Paper-box factory—covering machine —topping and labeling machine Broom factory—sorting corn (10) Hosiery factory—knitting machine Tailor factory—sorting goods Cigar factory—bunch breaking (12) Gum factory—packer (13) Piano factory—covering pedals
6	16
Salesgirl Candy store Grocery (7) Creamery and butter store	
3	0

* Duplicate positions in different groups have been indicated by numbers in parentheses.

TABLE 634—*Continued*

Girls

Highest 10 Per Cent Physical		Lowest 10 Per Cent Physical	
Sewing Trades (6) Power machine—skirt and suit company	1	Machine sewing—tailor Hand sewing—tailor shop Trimmings—wholesale clothing Sewing room—overall factory Giving out work—tailor Power machine sewing—overall company Finishing—uniform makers Making sleeves—tailor	8
Telegraph and Telephone Operator Telegraph operator Telephone operator	2		0
Married	3		1
Miscellaneous Inside messenger—department store (5) Millinery—making hats House work—private family In school Painting postals—art company	5	Wrapper—department store	1
Lost	2		3
Total	29		29

ones are found in these occupations. There are three of the superior and but one of the inferior married. The kinds of factory work in which the two groups are employed is completely different. There are six inferior and no superior girls in shoe factories. There are two inferior girls in candy factories and two in paper-box factories, but no superior girl in either. On the other hand, there are three superior girls in soap factories and two in flag factories, but no inferior girl in either.

The two mental extremes (Table 634) show somewhat different types of contrast. The superior ones are found in office work, sales positions, sewing, and millinery, while only a scattering few of the inferior are in these groups. The inferior are found in factory work and in a few miscellaneous jobs. Two of them were helping at home, and three were lost, while no

TABLE 634—*Continued*

Girls

Highest 10 Per Cent Mental	Lowest 10 Per Cent Mental
Office Work	
(2) General office work—linotype company (3) Cashier in tube room—department store (4) Mail order clerk and telephone operator—department store Stenographer — wholesale millinery company Cashier—department store Office work and filing—soap factory General office work—wholesale grocer Clerk in payroll office—shoe factory Stenographer—sewing machine company Bookkeeper—city ice company	Telephone operating and typing—wholesale milliner (15) Cashier—grocery store
10	2
Factory Work	
(1) Packing medicines Packing sporting goods (13) Covering pedals—piano factory	Shoe factory— Rubbing down seams Tongue liner Tongue stitcher Rubber off and sock liner Cementing and trimming Finishing machine Candy factory— (8) Packer (9) Carrying trays (11) Paper-box factory—covering machine (10) Hosiery—knitting machine (12) Gum—packer Biscuits—packer (14) Flag company—press feeder Printing and engraving—hand stamper
3	14
Salesgirl	
Department store Ice cream soda counter (7) Grocery store Creamery and butter store	Bakery
4	1

TABLE 634—*Continued*

Girls

Highest 10 Per Cent Mental		Lowest 10 Per Cent Mental	
Sewing Trades			
Sewing-room—department store Sewing-room—overall company Power-machine operator—overall company Making coat linings—tailor (6) Power-machine operator—skirt and suit company Cutting pockets—tailor	6	Examiner—house-dress factory	1
Millinery			
(5) Making hats Trimmer	2		0
Helping at Home	0		2
Married	1		1
Miscellaneous			
Tying books—art company Wrapper—department store	2	Hand-painting—art company Errands and hand sewing—uniform company Buttoning shirts—laundry Housework—private family Taking ornaments out of oven—coffin company	5
Lost	1		3
Total	29		29

* Duplicate positions in different groups have been indicated by numbers in parentheses.

superior girl was helping at home and but one was lost. The same type of contrast in factory work obtains as in the case of the physical extremes. The inferior are found in shoe factories, candy factories, and paper box, gum, and biscuit factories, while no superior girl is found in any of these. There were but three superior girls in factories, and they were employed in a medicine factory, a sporting goods factory, and a piano factory. No inferior girl is found in any of these. The girl employed in packing medicines was superior both mentally and physically, but she had been ill and at home during the first three years after leaving school and was really in her first year of industrial work. The one employed in the piano factory was superior mentally, but very inferior physically.

Of the seven girls who were superior both mentally and physically, three were in office work, one a salesgirl, one in millinery, one in the tailoring trade doing power-machine operating, and one in factory work—the one who had been ill at home for three years and was in her first year of industrial work. Of the seven girls who were inferior both mentally and physically, two were in candy factories, one in a paper-box factory, one in the hosiery mills, one in a gum factory, and two could not be found.

SUMMARY OF THE KINDS OF WORK DONE BY GIRLS

I. The chief contrast in occupations between girls who are superior and those who are inferior consists in the fact that superior girls are found far more frequently in clerical and store positions and inferior ones in factory work. This distinction rests more upon mental than upon physical differences.

II. The sewing trade is entered by comparatively few of those who are superior physically. It offers a real opportunity to those who are very inferior physically but have a somewhat better mental endowment. It also offers opportunities to those of excellent mental endowment but less physical skill. Those who are most inferior mentally do not find permanent employment in the sewing trades.

III. The only girls who entered the millinery trade from the four groups were two who were mentally superior. One of them was also physically superior. They are permanent and successful in the trade.

IV. The only girls in the four groups who entered telephone or telegraph operating were three who were physically superior. None of them was mentally superior. Two of them were successful.

V. Factory work is much less common among the mentally superior than in any other group. The kind of factory work performed by the superior and the inferior differs somewhat, and the permanence of factory work differs greatly. About half of the factory work performed by each group is in shoe factories, but while many of the two inferior groups settle down to work year after year in shoe factories, few if any of the superior remain. Paper-box and candy factories employ all groups, but the inferior are more numerous and more permanent. Chewing-gum factories and hosiery mills have only inferior girls. The soap factories and the flag company have only those who are physically superior, though one of them was also mentally inferior.

SUMMARY OF CHAPTER XI

I. *Ability and earning capacity.*

(1) The only instance in which ability among children who leave school at fourteen has a marked effect on earning capacity is that of physical ability among boys. The general correlation between measures of physical ability and earning capacity is positive for boys and large enough to be significant. The difference between the earning capacity of highest and lowest 10 percents in physical tests is also large and consistent from year to year. Mental superiority in boys gives but an insignificant advantage in earning capacity. In the case of girls, while the differences are very small, the inferior tend to earn a little more than the superior.

(2) The earning capacity of the inferior tends to improve at a faster rate during the first four years than that of the superior. In the fourth year, while superior boys remain superior in earning capacity, they are relatively less so than in previous years. The superior mentally have an average weekly wage smaller than the inferior in the fourth year. The inferior girls, by the fourth year, rank ahead of the superior in every measure of earning capacity.

II. *Ability and regularity of employment.*

Boys who are superior either mentally or physically are employed a somewhat greater proportion of the year than boys who are inferior. The physically superior are also steadier in the sense of holding positions longer and thus having fewer positions in the course of a year. The mentally superior, on the other hand, hold more positions in the course of the year than the inferior. All these relationships are reversed in the case of girls. The inferior, both in mental and in physical standards, are employed a greater proportion of the year than the superior. The inferior physically are also steadier in the sense of holding fewer positions a year and holding them longer than the superior, while the inferior mentally hold more positions a year than the superior. The fact that differences between the extreme groups, whether mental or physical, boys or girls, are so small, is the most striking fact of all.

III. *Ability and kinds of work done.*

Very marked and decided relationships appear between grade of ability, mental and physical, and kinds of work done both among boys and among girls.

(1) Clerical workers, whether boys or girls, constitute a goodly proportion of the very superior, but are not found among the very inferior. The basis of selection is mental ability, but they are also of good physical ability.

(2) Employees of stores, particularly those in selling or in wrapping, which leads to selling, are found in large proportion among the superior, but are very infrequent among the inferior.

(3) Those who succeed in skilled trades, such as paper hanging, locksmithing, cutter in a shoe factory, electrician, or engineer in the case of the boys, and millinery, telegraph or telephone operating among the girls are found in the two superior groups.

(4) Factory work is common to all four groups of both sexes, but is much less frequent among the mentally superior boys and girls than in the other three groups. In both sexes, differences in factory employments appear between the extreme groups in terms of the kind of work done and of the length of time positions are held. The inferior boys and girls accept the more routine and unskilled types of factory work and stick to the job, often year after year. The superior, in spite of the fact that they are much more apt to get the good jobs, stay in factory work a shorter time.

IV. *Ability and social and industrial failure.*

The present study offers as indications of social and industrial failure, those who disappeared and left no trace behind, those who became hoboes, those who were placed in reformatories, and those who entered the Navy. The only suggestions of social failure among the superior were a few who were lost, and one boy who was under institutional care for a short time but later made good. The majority of those who disappeared and all of those who became hoboes or entered the Navy were in the very inferior groups. Among girls, those who disappeared constituted the only cases of social and industrial failure. They were more numerous among the inferior than among the superior.

V. *Conclusions.*

There seems to be little doubt that tests of the type employed in this study do measure ability. Not only their significant relation to school success, but their use in the Army and in various industrial undertakings establish the genuineness of the measure. Granting this, one is astonished to find ability so little recognized among the beginners in the industrial world in terms either of earning capacity or of steadiness of employment. Physical skill among boys commands a somewhat higher rate of pay, but mental ability gives no appreciable advantage. In the case of girls, inferiority, both mental and physical, gives a slight advantage. Industry is far more discriminating when it comes to kinds of work done. The conclusion is obvious. The jobs demanding more ability, such as simple grades of clerical work, salesmanship, or the early years in a skilled trade, are paid no better than the most routine and unskilled jobs. Not only does this hold for the first four years, but it is even more marked in the fourth year than in earlier ones. The fact that the superior children prefer so much to have the clerical, selling, or skilled trade positions, makes them willing to take these positions without additional pay. The employers pay only what they have to. The employer's usual comment—"the child isn't worth any more"—merely means that he can be obtained in sufficient numbers at that price. This study has shown that a vast number of the tasks of the industrial world can be satisfactorily performed by the very least well-endowed members of the community. Since they prove steadier workers at the routine and unskilled jobs, it is probably fairer to say that they are better qualified to fill the positions than the superior. This must mean that a vast number of people are employed at tasks which are beneath the level of their abilities, and are therefore ready to compete for a chance to be employed at a more congenial task, even at the same rate of pay.

The whole picture with regard to girls suggests that there is little real demand for girls in the industrial world, and that what little demand there is, is for inferior rather than for superior ones. Every placement secretary knows how much more frequent are the calls for boys than for girls on the part of employers, and how much more difficult girls are to place. The variety of positions and of industries open to boys (see Chapter X) is very much greater than in the case of girls. In the instances in which boys and girls are taken in large numbers by the same industry, it is very noticeable that the best paid work and the greatest proportion of the skilled work, goes to boys and men. The shoe industry is the best instance in our own series. The only skilled work given to women is some of the power-machine sewing, and that is paid for at a rate very much below that of the skilled jobs of the men. Our study of the kinds of boys and girls who enter the shoe industry and remain in it has shown that a much better grade of boys than of girls become shoe-factory operatives. The reason is doubtless that a good grade of boys are in demand in the trade for the variety of skilled or semi-skilled jobs it offers to them, while the girls who are wanted are the inferior ones who will be content with routine hand work or very simple machine tending year after year. What is true of the shoe factory is true on a larger scale for the industrial world in general. It makes some demand for ability in boys—particularly physical ability—to fill a variety of semi-skilled positions, but all it requires of girls is a dull spirit and a trifle of physical equipment which the poorest of them can furnish.

That differences in ability between the two sexes are not responsible has been amply shown by this study as well as many others. During the war so many tasks thought suitable to men only were easily and successfully performed by women that many an ancient faith as to what women could and could not do had to fall. Once more we are finding that the guiding principle of human affairs is not rhyme, or reason, or scientific fact, but the fitness of things as seen through the eyes of custom and prejudice.

The results of this study are in accord with other data. No adequate studies have been made of the relation between mental ability as measured by tests, and earning capacity. Studies of the relation between school grade completed and earning capacity have usually been based upon wider differences in educational attainment. The widely quoted statistics published by the Bureau of Education showing the large difference in earning capacity between those who leave school at fourteen and those who leave at eighteen, are based upon a contrast between those of approximately elementary school and those of high school attainment. There is room for further verification of this comparison based upon larger unselected groups. Meanwhile the conclusion that every additional year in school, or unit of school completed, means a proportionate increase in earning capacity is obviously not justified. Three years of additional school attainment in elementary schools makes no difference in earning capacity.

The relationship between kind of work performed and level of ability has been made on a large scale by the Army mental tests (1) since our data were completed. The general relationship shown in this study between poor ability and low-grade routine work, good ability and skilled trades, sales work and clerical work, is amply demonstrated by the Army results. The Army series, representing as it does not merely wide differences in ability but also wide differences in education, is not so well able to show what may be attributed to mere ability, with approximately constant levels of education.

A study of the relation between school grade completed and kind of work performed by tradesmen, made by Toops and Pintner (2), shows a similar tendency for the skilled trades to be recruited from those who completed the upper elementary or early high-school grades, and the unskilled and common laborer positions to be filled by those from the lower elementary grades. Indeed it seems clear enough that unskilled labor in some form is necessarily the only field of work open to those who have completed only the fifth or sixth grade of the elementary school. In most instances, degree of ability is closely related to the amount of education attained. Just how much of the industrial fate of an individual to charge to ability, and how much to degree of education, no one can be sure. This much, however, can be stated. Individuals whose school retardation and school leaving is conditioned primarily by poor ability, could not have succeeded at higher levels even though they had remained in school. On the other hand, individuals of excellent ability have but a limited chance in the occupational world without education beyond the level of the elementary school.

References

(1) Yerkes, Robert M. and Yoakum, Clarence S.—*Army Mental Tests.* New York: H. Holt & Co., 1920.

(2) Toops, H. A. and Pintner, Rudolf—"Educational Differences among Tradesmen," *Journal of Applied Psychology,* 1919, 3, 33–49.

CHAPTER XII

SOCIAL STATUS OF THE FAMILIES OF WORKING AND SCHOOL CHILDREN

In estimating the social status of the children studied, two classes of data are available. The first consists of facts bearing on the general conditions of life, such as religious affiliations, whether the parents were native or foreign-born, the occupation of the father, whether the mother worked outside of the home, the number of rooms occupied by the family, the presence or absence of lodgers, and, as an indication of stability, the number of different schools the child had attended. These records were made at the time of the first interview with the child. The second type of evidence was derived from visits to the homes of the children and estimates of various factors of home life. The present chapter will have to do with the facts derived from the interview, and the following one with the attempt to estimate home conditions.

The tables which have been prepared to sum up the facts with regard to social status show the relation to school grade within the working and school groups separately, and the summary of the total working and total school group for each sex. We will discuss first, the relation between working and school groups, and second, the relation to school grade. The relation to sex will be pointed out as each factor is discussed.

Comparison of Working and School Families

FATHERS' OCCUPATIONS

The classification of the occupations of the fathers presented all the usual difficulties of a classification of occupations, and the additional one that in some cases the occupation was stated in such a way that the exact kind of work performed could not be determined. The terms "machinist," "tailor," or "factory hand," cover a multitude of kinds of work of varying degrees of skill which could not be taken into account. A "merchant" may vary from the proprietor of a fruit stand to a wholesale dealer controlling many large establishments. The distinction between skilled and unskilled labor is an arbitrary and difficult one. The most that can be said for the present classification is that it has been entirely consistent in the various groups, and that a record has been kept showing what each division includes.

A complete list of occupations classed as skilled labor will be found in Table 638. Under unskilled labor, in addition to laborers, the following classes of workers were included: porters, packers of glass and china, furniture movers, freight-handlers, switchmen, workhouse guards, general

TABLE 635

FATHERS' OCCUPATIONS

Boys — M

Occupation	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Dead	29	24.2	23	18.9	20	18.9	13	20.6	85	20.7
Deserted or divorced . . .	3	2.5	10	8.2	3	2.8	1	1.6	17	4.1
Invalided . . .	2	1.7	2	1.6	2	1.9	1	1.6	7	1.7
Skilled labor .	44	36.7	54	44.3	44	41.5	26	41.1	168	40.9
Unskilled labor	12	10.0	10	8.2	11	10.4	6	9.5	39	9.5
Artist	0		0		0		0		0	
Bank porter . .	0		0		1	.9	1	1.6	2	.5
Banker	0		0		0		0		0	
Broker	0		0		0		0		0	
Collector . . .	1	.8	1	.8	0		0		2	.5
Contractor . .	1	.8	1	.8	1	.9	0		3	.7
Detective . . .	0		0		1	.9	0		1	.2
Farmer or truck gardener . .	0		0		0		0		0	
Insurance agent	0		0		1	.9	1	1.6	2	.5
Keeper of ball grounds . . .	0		0		0		0		0	
Janitor	0		2	1.6	0		0		2	.5
Landscape gardener	0		0		0		0		0	
Manager (business)	0		0		0		1	1.6	1	.2
Manufacturer .	0		0		0		0		0	
Merchant . . .	5	4.2	4	3.3	3	2.8	3	4.8	15	3.7
Office worker .	1	.8	0		1	.9	0		2	.5
Peddler	1	.8	0		0		0		1	.2
Piano tuner . .	0		0		0		0		0	
Picture-show manager . .	0		0		0		0		0	
Professions . .	0		0		1	.9	0		1	.2
Public service .	3	2.5	5	4.1	3	2.8	0		11	2.7
Reporter . . .	0		0		0		0		0	
Retired	0		0		0		0		0	
Salesman . . .	4	3.3	3	2.5	2	1.9	2	3.2	11	2.7
Saloon keeper or bartender . .	3	2.5	2	1.6	1	.9	2	3.2	8	1.9
Stock keeper .	1	.8	0		1	.9	0		2	.5
Teamster . . .	7	5.8	4	3.3	10	9.4	5	7.9	26	6.3
Vagabond . . .	1	.8	0		0		0		1	.2
Waiter	2	1.7	0		0		0		2	.5
Whiskey compounder . . .	0		0		0		0		0	
Not stated . .	0		1	.8	0		1	1.6	2	.5
Total	120	99.9	122	100.0	106	99.6	63	99.9	411	99.9

TABLE 635—*Continued*

Boys — X

Occupation	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Dead	18	21 4	17	12.5	21	13.0	14	9.5	70	13.1
Deserted or divorced	2	2.4	3	2.1	4	2.5	1	.7	10	1.9
Invalided	0		1	.7	2	1.2	0		3	.6
Skilled labor	38	45.2	61	43.3	52	32.1	47	31.1	198	37.0
Unskilled labor	8	9.5	4	2.8	3	1.8	2	1.4	17	3.2
Artist	0		0		2	1.2	1	.7	3	.6
Bank porter	0		0		0		0		0	
Banker	0		1	.7	0		0		1	.2
Broker	0		0		0		1	.7	1	.2
Collector	0		0		0		1	.7	1	.2
Contractor	1	1.2	1	.7	2	1.2	0		4	.7
Detective	0		1	.7	0		0		1	.2
Farmer or truck gardener	0		0		0		3	2.0	3	.6
Insurance agent	0		1	.7	1	.6	1	.7	3	.6
Keeper of ball grounds	1	1.2	0		0		0		1	.2
Janitor	0		1	.7	1	.6	0		2	.4
Landscape gardener	0		0		0		1	.7	1	.2
Manager (business)	0		2	1.4	3	1.8	4	2.7	9	1.7
Manufacturer	1	1.2	6	4.2	4	2.5	10	6.8	21	3.9
Merchant	6	7.1	10	7.1	22	13.6	15	10.1	53	9.9
Office worker	2	2.4	10	7.1	12	7.4	5	3.4	29	5.4
Peddler	1	1.2	1	.7	1	.6	1	.7	4	.7
Piano tuner	0		0		0		2	1.4	2	.4
Picture-show manager	1	1.2	0		0		0		1	.2
Professions	0		1	.7	9	5.6	11	7.4	21	3.9
Public service	1	1.2	9	6.4	6	3.7	14	9.5	30	5.6
Reporter	0		0		1	.6	0		1	.2
Retired	0		0		2	1.2	2	1.4	4	.7
Salesman	0		5	3.5	3	1.8	9	6.1	17	3.2
Saloon keeper or bartender	3	3.6	1	.7	3	1.8	2	1.4	9	1.7
Stock keeper	0		0		1	.6	0		1	.2
Teamster	0		3	2.1	7	4.3	1	.7	11	2.0
Vagabond	0		0		0		0		0	
Waiter	1	1.2	1	.7	0		0		2	.4
Whiskey compounder	0		1	.7	0		0		1	.2
Not stated	0		0		0		0		0	
Total	84	100.0	141	100.2	162	99.7	148	99.8	535	100.2

utility men about stores, factories and institutions, street cleaners, dishwashers, boiler cleaners, elevator operators, a cleaner of cages at the zoo and a rag shaker at the oil works. The only artists on the list were commercial ones, such as clothing designers. As office workers were classified clerks of various grades, bookkeepers, cashiers, accountants, proofreaders, draughtsmen, and stenographers. The professional group included architects, ministers, lawyers, doctors, dentists, veterinaries, engineers, chemists, and editors. Public service included train and street-car conductors, motormen, policemen, firemen, postmen, soldiers, superintendents of traction and railroad companies, ticket and passenger agents, revenue

TABLE 636

FATHERS' OCCUPATIONS

Girls — M

Occupation	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Dead	21	30.9	23	22.5	26	26.8	17	27.9	87	26.5
Deserted or divorced . . .	6	8.7	4	3.9	5	5.2	2	3.3	17	5.2
Invalided . . .	6	8.7	4	3.9	1	1.0	1	1.6	12	3.7
Skilled labor .	17	25.0	42	41.2	41	42.3	22	36.1	122	37.2
Unskilled labor	4	5.9	11	10.8	10	10.3	2	3.3	27	8.2
Artist									0	
Collector . . .	0		0		0		1	1.6	1	.3
Contractor . .	0		0		0		1	1.6	1	.3
Farmer or truck gardener . .	0		0		0		0		0	
Insurance agent	1	1.5	0		0		0		1	.3
Janitor	1	1.5	0		0		1	1.6	2	.6
Manager (business)	0		0		0		0		0	
Manufacturer .	0		0		0		1	1.6	1	.3
Merchant . . .	0		0		1	1.0	2	3.3	3	.9
Motion picture exhibitor . .	0		0		0		0		0	
Office worker .	1	1.5	3	2.9	1	1.0	2	3.3	7	2.1
Pawn broker .	0		0		0		0		0	
Peddler . . .	2	2.9	0		0		0		2	.6
Professions . .	0		0		0		1	1.6	1	.3
Public service .	1	1.5	3	2.9	2	2.1	2	3.3	8	2.4
Retired	0		0		0		0		0	
Salesman . . .	1	1.5	1	1.0	4	4.1	2	3.3	8	2.4
Saloon keeper .	2	2.9	1	1.0	2	2.1	1	1.6	6	1.8
Teamster . . .	4	5.9	7	6.9	4	4.1	2	3.3	17	5.2
Waiter	0		0		0		0		0	
Not stated . .	1	1.5	3	2.9	0		1	1.6	5	1.6
Total	68	99.9	102	99.9	97	100.0	61	99.9	328	99.9

TABLE 636—*Continued*

Girls—X

Occupation	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Dead	12	18.2	13	13.0	17	13.1	13	11.2	55	13.4
Deserted or divorced	5	7.6	5	5.0	2	1.5	2	1.7	14	3.4
Invalided	1	1.5	1	1.0	2	1.5	0		4	.9
Skilled labor	31	46.9	45	45.4	49	37.7	36	31.0	161	39.1
Unskilled labor	4	6.1	6	6.6	5	3.9	2	1.7	17	4.2
Artist	0		0		0		1	.9	1	.2
Collector	0		1	1.0	0		1	.9	2	.5
Contractor	0		0		0		3	2.6	3	.7
Farmer or truck gardener	0		0		0		1	.9	1	.2
Insurance agent	0		0		0		1	.9	1	.2
Janitor	0		0		2	1.5	0		2	.5
Manager (business)	1	1.5	0		1	.8	1	.9	3	.7
Manufacturer	0		1	1.0	5	3.9	4	3.4	10	2.4
Merchant	3	4.5	7	7.0	22	16.9	18	15.5	50	12.2
Motion-picture exhibitor	0		0		0		1	.9	1	.2
Office worker	1	1.5	1	1.0	7	5.4	6	5.1	15	3.7
Pawn broker	0		0		0		1	.9	1	.2
Peddler	1	1.5	1	1.0	0		0		2	.5
Professions	0		0		4	3.1	13	11.2	17	4.2
Public service	0		2	2.0	4	3.1	4	3.4	10	2.4
Retired	0		0		2	1.5	0		2	.5
Salesman	1	1.5	6	6.0	3	2.3	6	5.1	16	3.9
Saloon keeper	2	3.0	0		3	2.3	1	.9	6	1.5
Teamster	4	6.1	9	9.0	2	1.5	0		15	3.7
Waiter	0		1	1.0	0		1	.9	2	.5
Not stated	0		0		0		0		0	
Total	66	99.9	99	100.0	130	100.0	116	100.0	411	99.9

officers, clerk of the court, an officer of the United States sub-treasury, water-meter readers, and railway mail clerks. Salesmen included traveling salesmen, retail clerks, solicitors for various kinds of business houses, and real estate agents.

Tables 635 and 636 give the general classifications of occupations.

The working group contains almost twice as many families that are without the father's support as the school group. Cases in which the mother had remarried after the death of the father and the step-father was supporting the family were included with the normally constituted families and classified according to the occupation of the step-father. The families which were without a father's support constitute among the boys 26 per cent of the working group and 15.6 per cent of the school group, and among the girls 35.4 per cent of the working group and 17.8 per cent of the school group. The proportion of skilled labor represented in the two groups is similar—about 40 per cent. Among the boys it is 40.9 per cent of the working group and 37.0 per cent of the school group, while among the girls it is 37.2 per cent of the working group and 39.2 per cent of the school group. Unskilled labor is a bit more than twice as frequent in the working group as in the school group. Among boys it constitutes 9.5 per cent of the working and 3.2 per cent of the school group, while among girls the proportion is 8.2 per cent working and 4.1 per cent school. If one classes together as business men, merchants, manufacturers, and business managers they are seen to comprise 15 per cent of the two school series and but 3.6 per cent of the boys and 1.2 per cent of the girls in the working series. Indeed, the working series contains but one business manager and one manufacturer. The merchant class is represented by small shop keepers. The professional and office workers are also confined chiefly to the school group, of which they each constitute about 4 or 5 per cent. In the working group there were but two fathers in professions (less than 1 per cent) and less than 2 per cent in office work. Public service employees constituted about 2.5 per cent of all groups except the boys' school series, in which they were 5.6 per cent. Salesmen and saloon keepers were about equally represented in the two series, salesmen with about 4 per cent and saloon keepers with a bit less than 2 per cent. Teamsters were almost twice as frequent in the working as in the school series. They represented 5 to 6 per cent of the working series and 2 to 3.5 per cent of the school series.

An analysis of the details of the group classification shows further differences. In families which were deprived of the support of the father through death, illness or desertion, the occupation of the mother was recorded and the facts are presented in Table 637. The proportion of mothers in these families who have no occupation except homemaker is larger in the school than in the working group. It is 42 per cent of the school group and but 27 per cent of the boys and 41 per cent of the girls in the working group. The number of mothers who were doing laundry work to help support the family comprises about 26 per cent of the working group, but less than 10 per cent of the school group. The proportion of mothers acting as cleaning women, domestic assistants, boarding-house keepers, or dressmakers or sewing-women, differs little in the two groups. Tailor shop and factory work is somewhat more frequent in the school group, though the difference is not large. Occupations which are represented in the school group, but not found in the working group are business manager, insurance agent, milliner, barmaid, artist, office worker, dietitian, and commercial artist. The only occupations found in the working group but not represented in the school group are canvasser and waitress. The proportion of children who are cared for by relatives or adopted parents because of the loss of the mother is about the same in the two groups, though more of the school group have lost the mother through death, and more of the working group have lost her because of delinquency or a disappearance which is probably due to delinquency. The chief difference, then, is that more of the mothers in the school group are unemployed and more of them are employed in a variety of skilled occupations, while the mothers of the working group predominate in laundry work.

The complete list of occupations classed as skilled, with the number of fathers from working and school groups represented in each is presented in

TABLE 637

NO FATHER — MOTHERS' OCCUPATIONS

Mother's Occupation	M				X			
	Boys		Girls		Boys		Girls	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
No occupation	30	27.5	48	41.4	35	42.2	31	42.5
Washing	28	25.7	20	17.2	4	4.8	8	10.9
Laundry hand	2	1.8	10	8.6	1	1.2	2	2.7
Cleaning	12	11.0	6	5.2	11	13.3	5	6.8
Domestic service	8	7.3	4	3.4	5	6.0	3	4.1
Boarding-house keeper	1	.9	4	3.4	2	2.4	1	1.4
Waitress	1	.9						
Barmaid					1	1.2		
Janitress	3	2.8	1	.9			1	1.4
Merchant	4	3.7	1	.9	1	1.2	1	1.4
Saleswoman			2	1.7	4	4.8	1	1.4
Business manager					1	1.2	1	1.4
Canvasser	1	.9	1	.9				
Insurance agent							1	1.4
Dressmaking and sewing	6	5.5	4	3.4	3	3.6	5	6.8
Tailor shop	3	2.8	5	4.3	2	2.4		
Milliner							1	1.4
Factory work	2	1.8	3	2.6	3	3.6	6	8.2
Artist					1	1.2		
Office work					1	1.2	2	2.7
Dietitian					1	1.2		
Commercial art							1	1.4
Dead (child with relatives)	4	3.7	3	2.6	6	7.2	2	2.7
Remarried (child with relatives)					1	1.2		
Delinquent or unknown			1	.9			1	1.4
Unaccounted for—child adopted or with relatives	4	3.7	3	2.6				
Total	109	100.0	116	100.0	83	99.9	73	100.0

TABLE 638

SKILLED LABOR

	M	X	Total
Abattoir hand	3	2	5
Auto-repairer	1	0	1
Baker	3	10	13
Barber	4	12	16
Beltmaker	0	1	1
Blacksmith	12	9	21
Boarding-house keeper	1	0	1
Boilermaker	0	1	1
Bookbinder	1	1	2
Box-maker	3	2	5
Brass-finisher	0	1	1
Brewery hand	7	6	13
Bricklayer	2	0	2
Bridge-building hand	1	0	1
Buffer	1	1	2
Butcher	1	13	14
Can-factory hand	1	0	1
Candle-maker	1	0	1
Candy-maker	0	1	1
Cap-blocker	0	1	1
Car-inspector	0	1	1
Car-repairer	1	3	4
Carpenter or cabinet-maker	18	22	40
Carpet-layer	2	1	3
Carriage-factory hand	5	13	18
Cementer	2	1	3
Chauffeur	0	7	7
Cigar-factory hand	7	3	10
Coffin-trimmer	0	1	1
Cook	1	2	3
Coppersmith	8	5	13
Core-maker	1	0	1
Dry-cleaner	0	3	3
Electrician	1	4	5
Engraver	1	1	2
Expressman	0	3	3
Foreman	14	19	33
Foundryman	1	1	2
Furnace-maker	0	1	1
Furniture-factory hand	1	3	4
Furniture-repair man	1	0	1
Gardner	2	0	2
Gas fitter and pipe layer	2	4	6
Gas-tank erector	0	1	1
Glazier	1	1	2
Glove-factory hand	2	0	2
Gold refiner	0	1	1
Grainer	1	0	1
Hammersmith	0	1	1
House-wrecking hand	0	1	1
Iron- or metal-worker	5	6	11
Lead-worker	0	1	1
Leather-worker	1	1	2
Lithographer	1	0	1
Locksmith	1	2	3
Locomotive engineer	1	2	3
Locomotive inspector	0	1	1
Lumber-company hand	1	5	6
Machinist	25	30	55
Marble-cutter	1	3	4
Meter-tester	1	0	1
Milk-bottle filler	1	0	1
Moulder	7	6	13
Moving-picture operator	0	1	1
Oil-well sinker	1	0	1
Painter or varnisher	15	5	20
Paper-cleaner	1	0	1
Paper-factory hand	6	0	6
Paper-hanger	8	6	14
Paste and glue-maker	1	0	1
Pattern-maker	1	1	2
Pavement-layer	0	1	1
Pile-driver	1	0	1
Planing-mill hand	1	0	1
Plasterer	1	1	2
Plater (metal)	3	3	6
Piano-polisher	0	1	1
Plumber	1	4	5
Polisher	3	0	3
Potter	1	1	2

TABLE 638—*Continued*

	M	X	Total
Pressman	1	2	3
Printer	0	9	9
Rolling-mill hand	1	1	2
Railroad-crew boss	1	0	1
Railroad-yard boss	0	1	1
Railroad gas-lighter on cars	0	1	1
Railroad depot master	0	1	1
Saddler	2	2	4
Safe-maker	2	0	2
Sausage-maker	1	0	1
Sawyer	1	0	1
Scale-repairer	0	1	1
Shoe-factory hand or shoemaker	14	12	26
Sign painter	0	1	1
Slate worker	1	0	1
Soap-factory hand	2	1	3
Stable boss	1	5	6
Stationary engineer or fireman	9	19	28
Stencil worker	1	0	1
Stove-maker	0	3	3
Stonemason	8	4	12
Superintendent	1	10	11
Tailor	20	26	46
Tannery hand	7	1	8
Telephone inspector	0	1	1
Telephone repairman	2	0	2
Tinner	2	2	4
Upholsterer	0	3	3
Valve cleaner	1	0	1
Varnish tester	1	0	1
Veneer cutter	1	1	2
Watch-maker	0	1	1
Weigher for Chamber of Commerce	0	1	1
Whitewasher	4	1	5
Woodworker	3	4	7
Total	290	359	649

Table 638. The number of individuals represented is in most cases so small that it is impossible to draw conclusions. However, there are certain occupations which are proportionately more frequent in the working group, and others which are proportionately more frequent in the school group, and these it seemed worth while to list. There are but five-sixths as many working as school children—a fact which must be kept in mind in reading the table. Basing the list upon occupations in which five or more fathers are represented, the trend is as follows: occupations in which the fathers tend to keep children in school include all minor administrative positions such as foreman, superintendent or stable boss, and the following trades: baker, barber, butcher, carriage factory worker, chauffeur, electrician, gas-fitter and pipe-layer, lumber-company employee, plumber, printer, and stationary engineer or fireman. The occupations which show no difference in the tendency toward work or school are carpenter, iron- or metal-worker, machinist, plater (metal), tailor, and woodworker. The occupations in which the trend is toward work rather than toward school are abattoir hand, blacksmith, box-maker, brewery hand, cigar-factory hand, coppersmith, moulder, painter or varnisher, paper-factory hand, paper hanger, shoe-factory hand, stonemason, tannery hand, and whitewasher.

Among business men, the merchant class only has a real representation in the working group. The list of merchants in the working group is made up almost entirely of small shop keepers dealing in butter and eggs, fruit, cigars, confectionery, pretzels, furniture, shoes, haberdashery, or groceries. The school group included a far greater variety of stores and shops, many of them large retail affairs or wholesale establishments. The list of public service employees found in the working group included street-car conductors and motormen, policemen, firemen, postmen, a soldier, and a City Hall employee. The school group contained representatives of the same classes but in addition it included sergeants and lieutenants of police, captains in the fire department, railroad conductors, a ticket agent, a passenger agent, a railway mail clerk, a railway rate inspector, a revenue officer, a division superintendent of the traction company, an officer of the sub-treasury, a clerk of the court, and a constable of the court. The office workers among the fathers of the working series consisted exclusively of lesser clerks, such as entry clerks, shipping clerks, or railroad yard clerks. Among the fathers of the school children in addition to these were chief clerks, bookkeepers, cashiers, accountants, draughtsmen, a proof reader, and a Western Union clerk.

The difference between the occupations of fathers in the two groups can be summed up as follows: The working group exceeds the school group significantly in the number of families deprived of a father's support and in the number of fathers employed in unskilled labor and as teamsters—an occupation which might also be classed as unskilled. The school group contained practically all of the fathers who were business managers, manufacturers, professional men, and most of the merchants and office workers. The proportion of fathers who were skilled laborers, public service employees, salesmen, and saloon keepers differed little in the two groups. No other occupations were represented in sufficient numbers to furnish a basis for conclusions.

A further contrast between the two groups consisted in the fact that in occupations represented in both, the fathers of the working children were found in the less skilled trades, in the small shops, in the minor office positions, and in the more routine types of public service.

RELIGIOUS AFFILIATIONS

The classification of religious affiliations was merely Jewish, Catholic, and Protestant. Tables 639 and 640 present the facts with regard to the two groups and the two sexes. In the working group there are, disregarding fractions of percents, 2 per cent Jews, 57 per cent Catholics, and 34 per cent Protestants. In the school group there are 12 per cent Jews, 21 per cent Catholics, and 65 per cent Protestants. In both groups there is a small percentage in which no record of religion was made. We do not know the exact proportion of each religion represented in the community. So far as Catholics are concerned, the interpretation of these figures is rendered still more difficult by the fact that, while the working group represents Catholic children leaving both public and parochial schools, the school group represents merely those remaining in public schools. The Jews and the Protestants, however, except for a negligible number of both sects who patronize private schools, send their children to public schools. It is interesting to note that of the 133 Jewish children in the two groups, 14, or 10.5 per cent, were found among working children and 89.5 per cent among school children. Of the 883 Protestant children in the two groups, 260, or 29.4 per cent, are found in the working group and 70.6 per cent in the school group. Of the 549 Catholic children, 376, or 68.4 per cent, are found in the working group and 31.6 per cent in the school group. The figure for the proportion of Catholic children in school is too small because, as we have pointed out, it does not consider the children remaining in parochial schools. It is perfectly clear, however, that Jewish families have a much stronger tendency to keep their children in school than Protestant families. It is very probable that Protestant families have a stronger tendency to keep children in school than Catholic families.

TABLE 639

RELIGIOUS AFFILIATIONS

Boys — M

	GRADE V		GRADE VI		GRADE VII		GRADE VIII		TOTAL	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Jewish	8	6.7	0	.0	0	.0	2	3.2	10	2.4
Catholic . . .	51	42.5	72	59.0	70	66.0	41	65.1	234	56.9
Protestant . .	51	42.5	39	32.0	33	31.1	16	25.4	139	33.8
No record . .	10	8.3	11	9.0	3	2.8	4	6.4	28	6.8
Total	120	100.0	122	100.0	106	99.9	63	100.1	411	99.9

Boys — X

	GRADE V		GRADE VI		GRADE VII		GRADE VIII		TOTAL	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Jewish	5	5.9	5	3.5	27	16.7	25	16.9	62	11.6
Catholic . . .	26	30.9	35	24.8	26	16.0	24	16.2	111	20.7
Protestant . .	46	54.8	94	66.7	107	66.0	98	66.2	345	64.5
No record . .	7	8.3	7	5.0	2	1.2	1	.7	17	3.2
Total	84	99.9	141	100.0	162	99.9	148	100.0	535	100.0

TABLE 640

RELIGIOUS AFFILIATIONS

Girls — M

	GRADE V		GRADE VI		GRADE VII		GRADE VIII		TOTAL	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Jewish	0	.0	4	3.9	0	.0	0	.0	4	1.2
Catholic . . .	25	36.8	14	13.7	65	67.0	38	62.3	142	43.3
Protestant . .	32	47.1	41	40.2	26	26.8	22	36.1	121	36.9
No record . .	11	16.2	43	42.1	6	6.2	1	1.6	61	18.6
Total	68	100.1	102	99.9	97	100.0	61	100.0	328	100.0

Girls — X

	GRADE V		GRADE VI		GRADE VII		GRADE VIII		TOTAL	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Jewish	1	1.5	14	14.1	26	20.0	16	13.8	57	13.8
Catholic . . .	12	18.2	12	12.1	24	18.5	14	12.1	62	15.1
Protestant . .	51	77.3	70	70.7	75	57.7	82	70.7	278	67.7
No record . .	2	3.0	3	3.0	5	3.9	4	3.5	14	3.4
Total	66	100.0	99	99.9	130	100.1	116	100.1	411	100.0

NUMBER OF SCHOOLS ATTENDED

The number of schools attended has been taken to indicate, roughly, the stability of the two groups and the extent to which mere shifting from school to school may have been a factor in retardation and consequent elimination from schools. Tables 641 and 642 present the facts. Surprisingly enough, there is comparatively little difference between the two groups. The working series, both boys and girls, show a larger percentage than the school children who had attended but one school up to fourteen years. For the working group, the proportion attending but one school is from 30 to 35 per cent, while in the school group it is from 15 to 20 per cent. The proportion attending more than three schools is greater in the school than in the working group. The majority of the school group were high-school children and the compulsory shift from elementary to high school, which affects a larger proportion of school than of working children, probably accounts for the difference. We can only conclude that our figures show no clear difference in number of schools attended between the working and the school groups, and that stability of residence has not been a large factor in keeping children in school.

BIRTHPLACE OF PARENTS

In classifying the birthplace of the parents, we have merely recorded whether both parents were American-born, the father American-born and the mother foreign, the mother American-born and the father foreign, or both parents foreign-born. Tables 643 and 644 present the facts. In the working group, 23 per cent of the boys and 32 per cent of the girls belong in families in which both parents were American-born, while the proportions from the school group are 57 per cent of the boys and 59 per cent of the girls. In the working group, 53 per cent of the boys and 45 per cent of the girls belong in families in which both parents were foreign-born, while the corresponding proportions for the school group are 24 per cent of the

TABLE 641

NUMBER OF SCHOOLS ATTENDED UP TO FOURTEEN YEARS

Boys — M

No. of Schools	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1	25	20.8	35	28.7	41	38.7	23	36.5	124	30.2
2	38	31.7	42	34.4	39	36.8	24	38.1	143	34.8
3	31	25.8	29	23.8	20	18.9	11	17.5	91	22.1
4	15	12.5	10	8.2	4	3.8	3	4.8	32	7.8
5	7	5.8	3	2.5	0	—	2	3.2	12	2.9
6	2	1.7	2	1.6	1	.9	0	—	5	1.2
7 and over . .	2	1.7	1	.8	1	.9	0	—	4	.9
No record . .	0	—	0	—	0	—	0	—	0	—
Total	120	100.0	122	100.0	106	100.0	63	100.1	411	99.9

Boys — X

No. of Schools	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1	14	16.7	20	14.2	31	19.1	44	29.7	109	20.4
2	29	34.5	36	25.5	78	48.2	55	37.2	198	37.0
3	21	25.0	35	24.8	27	16.7	33	22.3	116	21.7
4	13	15.5	34	24.1	16	9.9	10	6.8	73	13.6
5	4	4.8	10	7.1	8	4.9	0	—	22	4.1
6	3	3.6	4	2.8	1	.6	0	—	8	1.5
7 and over . .	0	—	2	1.4	0	—	1	.7	3	.6
No record . .	0	—	0	—	1	.6	5	3.4	6	1.2
Total	84	100.1	141	99.9	162	100.0	148	100.1	535	100.1

boys and 24 per cent of the girls. In the working group, 20 per cent of the boys and 32 per cent of the girls belong in families in which one parent is foreign born, while in the school group, 18 per cent of the boys and 16 per cent of the girls are in the same group. It is clear that native-born parents are far more apt, one might say twice as apt, to keep their children in school as foreign-born parents. In the present group the foreign-born parents are about 80 per cent German. No clear trends appear in families in which one parent is foreign-born except the one already noted—that the proportion of them in the working group is larger than that in the school group. So far as these tables go, no clear differences in tendency between families with foreign-born mothers and those with foreign-born fathers appear.

TABLE 642

NUMBER OF SCHOOLS ATTENDED UP TO FOURTEEN YEARS

Girls — M

No. of Schools	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1	21	30.9	34	33.3	38	39.2	23	37.7	116	35.4
2	32	47.1	41	40.2	31	31.9	20	32.8	124	37.8
3	8	11.8	21	20.6	17	17.5	12	19.7	58	17.7
4	3	4.4	3	2.9	7	7.2	5	8.2	18	5.5
5	2	2.9	2	1.9	2	2.1	1	1.6	7	2.1
6	2	2.9	1	.9	2	2.1	0	—	5	1.5
7 and over . .	0	—	0	—	0	—	0	—	0	—
No record . .	0	—	0	—	0	—	0	—	0	—
Total	68	100.0	102	99.8	97	100.0	61	100.0	328	100.0

Girls — X

No. of Schools	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1	15	22.5	10	10.2	6	4.6	33	28.5	64	15.6
2	21	31.8	32	32.3	66	50.8	36	31.0	155	37.7
3	20	30.3	29	29.3	37	28.5	29	25.0	115	28.0
4	7	10.6	18	18.2	14	10.8	9	7.8	48	11.7
5	2	3.0	3	3.0	6	4.6	5	4.3	16	3.9
6	0	—	2	2.0	0	—	1	.9	3	.8
7 and over . .	1	1.5	5	5.1	0	—	2	1.7	8	1.9
No record . .	0	—	0	—	1	.7	1	.9	2	.5
Total	66	99.7	99	100.1	130	100.0	116	100.1	411	100.1

TABLE 643

BIRTHPLACE OF PARENTS

Boys — M

	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Both American	33	27.5	32	26.2	21	19.8	9	14.3	95	23.1
Father foreign	14	11.7	6	4.9	15	14.1	5	7.9	40	9.7
Mother foreign	12	10.0	18	14.7	7	6.6	7	11.1	44	10.7
Both foreign .	54	45.0	65	53.3	60	56.4	40	63.2	219	53.3
No record . .	7	5.8	1	.8	3	2.8	2	3.2	13	3.2
Total	120	100.0	122	99.9	106	99.7	63	99.7	411	100.0

Boys — X

	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Both American	42	50.0	85	60.3	95	58.6	81	54.7	303	56.6
Father foreign	8	9.5	18	12.8	13	8.0	19	12.8	58	10.8
Mother foreign	6	7.1	14	9.9	10	6.2	6	4.1	36	6.7
Both foreign .	28	33.3	23	16.3	38	23.4	38	25.7	127	23.7
No record . .	0	.0	1	.7	6	3.7	4	2.7	11	2.1
Total	84	99.9	141	100.0	162	99.9	148	100.0	535	99.9

TABLE 644

BIRTHPLACE OF PARENTS

Girls — M

	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Both American	19	27.9	35	34.3	32	33.0	20	32.8	106	32.3
Father foreign	11	16.2	10	9.8	10	10.3	11	18.0	42	12.8
Mother foreign	9	13.2	8	7.8	9	9.3	5	8.2	31	9.4
Both foreign .	29	42.6	49	48.0	44	45.4	25	41.0	147	44.8
No record . .	0	.0	0	.0	2	2.1	0	.0	2	.5
Total	68	99.9	102	99.9	97	100.1	61	100.0	328	99.8

TABLE 644—*Continued*

Girls — X

	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Both American	45	68.2	61	61.6	61	46.9	74	63.8	241	58.6
Father foreign	7	10.6	4	4.0	14	10.8	12	10.4	37	9.0
Mother foreign	3	4.5	5	5.1	14	10.8	9	7.8	31	7.5
Both foreign .	11	16.7	29	29.3	39	30.0	20	17.2	99	24.1
No record . .	0	.0	0	.0	2	1.5	1	.9	3	.7
Total	66	100.0	99	100.0	130	100.0	116	100.1	411	99.9

LANGUAGE OF THE HOME

One would expect the language of the home to be closely related to the birthplace of the parents. In our groups this expectation is not fulfilled. The language of the home, as shown in Tables 645 and 646, is English in approximately 90 per cent of the families in each group, working and school. The majority of the children of foreign-born parents, therefore, belong in families which have become sufficiently Americanized to use English habitually at home, and the foreign-language factor can be eliminated as differentiating between our school and our working children.

MOTHERS AT WORK OUTSIDE THE HOME

The interpretation of the data with regard to the proportion of mothers working outside the home has been complicated by a circumstance which has also modified the next section—that relating to the presence or absence of lodgers in the home. The Tables 647 and 648 show a practically complete record on these points with regard to working children, but only an incomplete record with regard to school children. The laboratory workers, who made these records at the time of the child's first test, soon found that while such questions were comparatively easy to ask of working children, they were resented by some of the school children. Consequently, if the general background as revealed by the father's occupation, the size of the house occupied, and the appearance and manner of the child himself was such as to make it exceedingly improbable that the mother worked outside of the home or that the family kept lodgers, the question was frequently not asked. It was important to secure from the child a friendly attitude toward the examiner and the office in general, not only for the

TABLE 645

LANGUAGE OF THE HOME

Boys — M

	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
English	107	89.2	110	90.2	96	90.6	58	92.1	371	90.3
Foreign	12	10.0	12	9.9	9	8.5	5	7.9	38	9.2
No record . .	1	.8	0	.0	1	.8	0	.0	2	.5
Total	120	100.0	122	100.1	106	99.9	63	100.0	411	100.0

Boys — X

	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
English	74	88.1	127	90.1	149	92.0	132	89.2	482	90.1
Foreign	10	11.9	13	9.2	13	8.0	15	10.1	51	9.5
No record . .	0	.0	1	.7	0	.0	1	.7	2	.4
Total	84	100.0	141	100.0	162	100.0	148	100.0	535	100.0

TABLE 646

LANGUAGE OF THE HOME

Girls — M

	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
English	61	89.7	92	90.2	89	91.7	59	96.7	301	91.8
Foreign	7	10.3	10	9.8	8	8.3	2	3.3	27	8.2
No record . .	0	.0	0	.0	0	.0	0	.0	0	.0
Total	68	100.0	102	100.0	97	100.0	61	100.0	328	100.0

Girls — X

	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
English	65	98.5	94	94.9	121	93.1	100	86.2	380	92.4
Foreign	1	1.5	4	4.0	8	6.2	16	13.8	29	7.1
No record . .	0	.0	1	1.0	1	.7	0	.0	2	.5
Total	66	100.0	99	99.9	130	100.0	116	100.0	411	100.0

TABLE 647 — MOTHER WORKING

Boys — M

Mother at Work	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Yes	39	32.5	37	30.3	24	22.7	8	12.7	108	26.3
No	79	65.8	83	68.0	82	77.3	55	87.3	299	72.7
No record . .	2	1.7	2	1.6	0	.0	0	.0	4	1.0
Total	120	100.0	122	99.9	106	100.0	63	100.0	411	100.0

Boys — X

Mother at Work	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Yes	26	30.9	18	12.8	22	13.6	13	8.8	79	14.8
No	39	46.4	87	61.7	87	53.7	98	66.2	311	58.1
No record . .	19	22.6	36	25.5	53	32.7	37	25.0	145	27.1
Total	84	99.9	141	100.0	162	100.0	148	100.0	535	100.0

TABLE 648 — MOTHER WORKING

Girls — M

Mother at Work	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Yes	28	41.2	29	28.4	26	26.8	44	72.1	127	38.7
No	40	58.8	70	68.6	66	68.0	16	26.2	192	58.5
No record . .	0	.0	3	2.9	5	5.2	1	1.6	9	2.7
Total	68	100.0	102	99.9	97	100.0	61	99.9	328	99.9

Girls — X

Mother at Work	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Yes	21	31.8	15	15.2	20	15.4	9	7.8	65	15.8
No	25	37.9	56	56.6	74	56.9	64	55.2	219	53.3
No record . .	20	30.3	28	28.3	36	27.7	43	37.1	127	30.9
Total	66	100.0	99	100.1	130	100.0	116	100.1	411	100.0

TABLE 649 — LODGERS IN THE HOME

Boys — M

Lodgers Present	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Yes	10	8.3	9	7.4	5	4.7	6	9.5	30	7.3
No	108	90.0	112	91.8	100	94.3	56	88.9	376	91.5
No record . .	2	1.7	1	8	1	.9	1	1.6	5	1.2
Total	120	100.0	122	100.0	106	99.9	63	100.0	411	100.0

Boys — X

Lodgers Present	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Yes	14	16.7	22	15.6	13	8.0	16	10.8	65	12.2
No	65	77.4	90	63.8	97	59.9	112	75.7	364	68.0
No record . .	5	5.9	29	20.6	52	32.1	20	13.5	106	19.8
Total	84	100.0	141	100.0	162	100.0	148	100.0	535	100.0

TABLE 650 — LODGERS IN THE HOME

Girls — M

Lodgers Present	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Yes	5	7.4	9	8.8	4	4.1	3	4.9	21	6.4
No	62	91.2	93	91.1	93	95.9	56	91.8	304	92.7
No record . . .	1	1.5	0	.0	0	.0	2	3.3	3	.9
Total	68	100.1	102	99.9	97	100.0	61	100.0	328	100.0

Girls — X

Lodgers Present	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Yes	6	9.1	12	12.1	12	9.2	4	3.5	34	8.3
No	57	86.4	68	68.7	86	66.2	60	51.8	271	65.9
No record . . .	3	4.5	19	19.2	32	24.6	52	44.8	106	25.8
Total	66	100.0	99	100.0	130	100.0	116	100.1	411	100.0.

sake of the test results, but also to secure his return for subsequent tests. In the tables it is approximately 30 per cent of school children for whom no record was set down with regard to the mother's employment outside of the home. There is a strong presumption that these cases belong in the *No* group. We will assume, therefore, that the proportion of positive answers is approximately correct for all groups. Among working children, 26 per cent of the boys and 37 per cent of the girls belonged in families in which the mother worked outside of the home. In the school group, 15 per cent of the boys and 16 per cent of the girls belonged in this group.

TABLE 651

NUMBER OF ROOMS OCCUPIED

Boys — M

No. of Rooms	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1	0	—	2	1.6	0	—	0	—	2	.5
2	39	32.5	18	14.8	17	16.0	7	11.1	81	19.7
3	24	20.0	41	33.6	34	32.1	17	27.0	116	28.2
4	26	21.7	28	22.9	23	21.7	17	27.0	94	22.9
5	17	14.2	14	11.5	16	15.1	13	20.6	60	14.6
6	9	7.5	10	8.2	12	11.3	3	4.8	34	8.3
7	1	.8	2	1.6	2	1.9	1	1.6	6	1.4
8	1	.8	4	3.3	1	.9	3	4.8	9	2.2
9 and over. . .	2	1.7	3	2.4	1	.9	0	—	6	1.4
No record . . .	1	.8	0	—	0	—	2	3.2	3	.7
Total	120	100.0	122	99.9	106	99.9	63	100.1	411	99.9

Boys — X

No. of Rooms	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1	3	3.6	1	.7	2	1.2	1	.7	7	1.2
2	17	20.2	15	10.6	10	6.2	3	2.0	45	8.4
3	22	26.2	32	22.7	56	34.6	42	28.4	152	28.4
4	22	26.2	28	19.9	23	14.2	20	13.5	93	17.4
5	8	9.5	18	12.7	18	11.1	19	12.8	63	11.8
6	6	7.1	19	13.5	17	10.5	18	12.2	60	11.0
7	1	1.2	6	4.3	12	7.4	15	10.2	34	6.4
8	2	2.4	5	3.5	8	4.9	12	8.1	27	5.0
9 and over. . .	3	3.6	6	4.3	16	9.9	15	10.2	40	7.5
No record . . .	0	—	11	7.8	0	—	3	2.0	14	2.6
Total	84	100.0	141	100.0	162	100.0	148	100.1	535	99.7

The facts indicate a stronger economic necessity for wage-earning among working than among school children.

LODGERS IN THE HOME

The figures with regard to the proportion of lodgers in the home (Tables 649 and 650) are open to the same criticism of incompleteness for the school group as those of the previous sections. Assuming that the positive answers in this case also are approximately correct, we find a somewhat larger proportion of school than of working children who have lodgers in the home. Among working children, 7 per cent of the boys and 6 per cent

TABLE 652

NUMBER OF ROOMS OCCUPIED

Girls — M

No. of Rooms	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1	6	—	1	.9	0	—	0	—	1	.3
2	21	30.9	26	25.5	14	14.4	10	16.4	71	21.6
3	16	23.5	33	32.3	31	31.9	16	26.2	96	29.3
4	17	25.0	14	13.7	18	18.6	13	21.3	62	18.9
5	7	10.3	13	12.7	14	14.4	8	13.2	42	12.8
6	2	3.0	10	9.8	14	14.4	7	11.5	33	10.1
7	0	—	4	3.9	2	2.1	5	8.2	11	3.4
8	4	6.0	0	—	2	2.1	1	1.6	7	2.1
9 and over. . .	1	1.5	1	.9	0	—	1	1.6	3	.9
No record . . .	0	—	0	—	2	2.1	0	—	2	.5
Total	68	100.2	102	99.7	97	100.0	61	100.0	328	99.9

Girls — X

No. of Rooms	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1	0	—	0	—	0	—	0	—	0	—
2	12	18.2	18	18.2	14	10.8	3	2.6	47	11.4
3	23	34.9	25	25.3	12	9.2	13	11.2	73	17.8
4	14	21.2	14	14.1	29	22.3	10	8.6	67	16.3
5	7	10.6	16	16.2	20	15.4	13	11.2	56	13.6
6	6	9.1	11	11.1	18	13.8	8	7.0	43	10.5
7	1	1.5	6	6.1	6	4.6	7	6.0	20	4.9
8	1	1.5	4	4.0	4	3.1	7	6.0	16	3.9
9 and over. . .	2	3.0	3	3.0	10	7.7	14	12.1	29	7.1
No record . . .	0	—	2	2.0	17	13.1	41	35.3	60	14.7
Total	66	100.0	99	100.0	130	100.0	116	100.0	411	100.2

of the girls have lodgers at home, while among the school children 12 per cent of the boys and 8 per cent of the girls have lodgers. The mothers of this group seem somewhat more likely to keep lodgers to help out the income, and much less likely to work outside of the home, than the mothers of working children.

NUMBER OF ROOMS OCCUPIED

The tables presenting the data with regard to the number of rooms occupied by the family (Tables 651 and 652) are fairly complete. It is interesting to note that in each of the four groups the families which occupy three rooms are the most numerous. In all of the groups except that of school girls, the three-room group represents 28 per cent or 29 per cent of the total number. Among school girls it is only 18 per cent. The families occupying but one room are negligible in all groups. Those occupying two rooms are more frequent in the working than in the school group. Of the working boys 20 per cent live in two rooms, and of the school boys 8 per cent. Of the working girls, 22 per cent live in two rooms, and of the school girls, 11 per cent. Those occupying more than four rooms are more frequent in the school than in the working group. Of the working boys 28 per cent, and of the school boys 42 per cent, belong in families which occupy five or more rooms. Of the working girls 29 per cent, and of the school girls 40 per cent, belong in families occupying five or more rooms. The tables show that the school children have a decided advantage in living quarters and presumably in general economic status.

SUMMARY

The social factors so far considered that show a clear difference between working and school groups are (a) the occupation of the father, (b) the proportion of the three main religions represented, (c) the question as to whether the parents are native or foreign-born, (d) the employment of the mother outside of the home, and (e) the number of rooms occupied by the family. The factors which differed little, if any, in the two groups are (a) the number of schools attended by the child, (b) the language of the home, and (c) the presence of lodgers in the home.

School Grade as Related to Social Factors

FATHER'S OCCUPATION

(Tables 635 and 636)

In the tables for the working children little relation appears between school grade completed at fourteen and father's occupation. Somewhat more of the fifth-grade children have lost their fathers than is the case in the upper grades. Fathers employed in skilled labor are somewhat more rare in the fifth than in the upper grades. Other occupations are so small in number that no conclusions can be drawn. In the tables for school children a much more distinct relation between school grade completed and father's occupation occurs. The proportion of families who have lost the support of the father is greater in the fifth grade than in any other. Skilled labor is more frequent in the lower grades and less so in the upper. On the other hand, business managers, manufacturers, merchants, and professional men appear in far greater proportion as the fathers of upper- than of lower-grade children.

RELIGIOUS AFFILIATIONS

(Tables 639 and 640)

Among working boys and girls, there was a larger proportion of both Jews and Protestants from the lower than from the upper school grades, while among Catholics the reverse was true. The table suggests that retardation is one of the important facts determining elimination from schools in the first two sects. Indeed, of the 14 Jewish children found in the working group, twelve were seriously retarded. Among Catholics, however, mere retardation does not appear to be a leading cause of elimination. More normal than retarded children were going to work.

The tables for the school group show that, among the Jews, those remaining in school displayed little retardation. Most of them were found in the upper grades. There seems nothing very significant about the relative proportions of Catholics and Protestants in the various school grades of the school group.

NUMBER OF SCHOOLS ATTENDED

(Tables 641 and 642)

Shifting about from school to school seems to have less bearing on the school grade completed at a given age than one would suppose. In every group, the children who attended but one school formed a larger proportion of the upper than of the lower grades. Among the boys, those who had attended more than three schools were more numerous in the lower than in the upper grades, though among the girls this tendency does not appear. On the whole, stability of school seems to be a small factor in school progress and seems to count for more among boys than among girls.

BIRTHPLACE OF PARENTS

(Tables 643 and 644)

The tables dealing with the birthplace of parents show that the children of foreign-born parents compared very favorably with those of American-born parents in school grade completed at a given time. Among working boys, the group of foreign-born parents had a decidedly better record in keeping the children up to grade than the native-born parents. In the other groups there were no clear trends.

LANGUAGE OF THE HOME

(Tables 645 and 646)

Like the birthplace of the parents, the language of the home seemed to have little influence on school grade completed. In the two groups of boys and in the group of working girls, the proportion of families using a foreign language at home was a little larger in the lower than in the upper grades, but among school girls the reverse was true. The largest proportion of any group using a foreign language in the home was the school girls of the eighth grade—14 per cent.

MOTHER'S EMPLOYMENT OUTSIDE OF THE HOME

(Tables 647 and 648)

The employment of the mother outside of the home had a decided relation, in all groups, to the school grade completed by the children. There were more working mothers belonging to the children of the lower grades, and fewer to those of the upper grades in every group. The working girls of the eighth grade, who had a phenomenally larger proportion of working mothers (72 per cent), were the only exception to this rule.

LODGERS IN THE HOME

(Tables 649 and 650)

The proportion of families keeping lodgers was somewhat greater in every group among the children of the lower grades than among the children of the upper grades.

NUMBER OF ROOMS OCCUPIED BY THE FAMILY

(Tables 651 and 652)

There was a clear relation between the school grade completed by the child and the number of rooms occupied by the family. In each of the four groups the proportion of families occupying two rooms was decidedly larger in the lower than in the upper grades and the proportion of families occupying five or more rooms decidedly larger in the upper than in the lower grades.

SUMMARY

The social factors which had a direct relation to school grade completed at a given age were chiefly those related to economic conditions—(a) the father's occupation, (b) the mother's employment outside of the home, (c) the number of rooms occupied, and (d) the presence of lodgers; (e) the number of schools attended also had a slight bearing on school grade completed.

The social factors which bore no consistent relation to school grade completed were (a) the birthplace of the parents and (b) the language of the home. Religion seemed to be differently related to school grade completed in the working and school groups, a fact which probably means differences of policy on the part of different religious groups toward children who are retarded in school.

Summary of the Relation of Social Factors to School Leaving and to School Progress

In comparing the social factors which differ in the working and school groups with those which are related to school grade, some interesting points become clear. The factors which are the best indices of economic conditions—the occupation of the father, the employment of the mother outside of the home, and the number of rooms occupied by the family—are related both to school progress while the children are in school and to elimination from school. The children in families which are at a disadvantage in these points are more apt to be retarded, and are more apt to leave school early, than the others. On the other hand, religion and the nativity of the parents are differently related to retardation and to school leaving. The foreign-born parents of native-born children do quite as well as the native-born parents in keeping children up to the school grade standard for age, but they are much more apt than native-born parents to take the children out of school as soon as the law allows. The three religious groups show no clear differences in the school retardation of their children except that the Jews do better than either Catholics or Protestants in preventing retardation among their children. The three groups differ clearly, however, in their relation to school leaving. The proportion of Jewish children who left as soon as the law permitted is exceedingly small (14 per cent) and is made up almost exclusively of retarded children. The proportion of Protestant children who left at the first possible moment is larger (29 per cent), but is made up of more retarded than normal children. The proportion of Catholic children leaving school is largest of all (68 per cent) and contains even more normal than retarded children. The comparison in this instance is less fair than in the others because children remaining in parochial schools are not included.

SOCIAL STATUS OF THE TWO SCHOOL GROUPS X_1 AND X_2

In addition to a comparison of the working and school groups in social status, the two school groups, X_1 and X_2, offer another opportunity for studying the relation between a group of social factors and the mental and physical status of the children. The X_1 group, as has been stated (Chapter II), was composed of children selected at the age of fourteen years as intending to remain in school. The schools from which they came were for the most part in the crowded industrial neighborhoods of the city. The X_2 group was composed of children who had remained in school until sixteen, were expecting to remain longer, and who came from districts lying farther from the center of the city. Many of them were from high-grade residential suburbs. The records of the employment-certificate office showed that a much larger proportion of the children in the schools from which our X_1 group came, left school to go to work at fourteen than in the

TABLE 653 — FATHERS' OCCUPATIONS

Boys

	X_1		X_2	
	No.	Per Cent	No.	Per Cent
Dead	56	13.3	14	12.2
Deserted or divorced	8	1.9	2	1.7
Invalided	3	.7	0	
Skilled labor	183	43.6	15	13.0
Unskilled labor	17	4.0	0	
Artist	3	.7	0	
Bank porter	0		0	
Banker	0		1	.9
Broker	0		1	.9
Collector	1	.2	0	
Contractor	2	.5	2	1.7
Detective	1	.2	0	
Farmer or truck gardener	2	.5	1	.9
Insurance agent	2	.5	1	.9
Keeper of ball grounds	1	.2	0	
Janitor	2	.5	0	
Landscape gardener	0		1	.9
Manager (business)	2	.5	7	6.1
Manufacturer	7	1.7	14	12.2
Merchant	38	9.0	15	13.0
Office worker	22	5.3	7	6.1
Peddler	4	.9	0	
Piano tuner	2	.5	0	
Picture-show manager	1	.2		
Professions	9	2.2	12	10.4
Public service	22	5.2	8	7.0
Reporter	1	.2	0	
Retired	1	.2	3	2.5
Salesman	11	2.6	6	5.2
Saloon keeper	7	1.7	2	1.7
Stock keeper	0		1	.9
Teamster	11	2.6	0	
Vagabond	0		0	
Waiter	1	.2	1	.9
Whiskey compounder	0		1	.9
Not stated	0		0	
Total	420	99.8	115	100.0

case of the schools from which the X_2 group came. Studies made by means of group tests showed that the general mental level of the children in the X_1 schools was below that of children in the X_2 schools.

The number of cases in each school grade becomes too small in this case to make comparisons on that basis of value. Only comparisons of the two groups are presented. The occupations of the fathers of X_1 and X_2 children are shown in Tables 653 and 654. The X_1 series contains proportionately a few more families than the X_2 in which the support of the father is lacking. The proportion for the boys of X_1 is 15.9 per cent and of X_2, 13.9 per cent, while for the girls of X_1 it is 18.0 per cent and of X_2, 16.9 per cent. Fathers who are skilled laborers are two or three times as frequent in X_1 as in X_2. The proportion for the boys' series of X_1 is 43.6 per cent and of X_2, 13.0 per cent. For the girls of X_1 it is 44.2 per cent and of X_2, 19.3 per cent. Manufacturers, merchants, office workers, and professional men

TABLE 654 — FATHERS' OCCUPATION

Girls

	X_1		X_2	
	No.	Per Cent	No.	Per Cent
Dead	42	12.8	13	15.7
Deserted or divorced	14	4.3	0	
Invalided	3	.9	1	1.2
Skilled labor	145	44.2	16	19.3
Unskilled labor	14	4.3	3	3.6
Artist	1	.3	0	
Collector	2	.6	0	
Contractor	1	.3	2	2.4
Farmer or truck gardener	1	.3	0	
Insurance agent	1	.3	0	
Janitor	1	.3	1	1.2
Manager (business)	2	.6	1	1.2
Manufacturer	3	.9	7	8.4
Merchant	36	11.0	14	16.9
Motion-picture exhibitor	0		1	1.2
Officeworker	9	2.7	6	7.2
Pawnbroker	1	.3	0	
Peddler	2	.6	0	
Professions	6	1.8	11	13.3
Public service	8	2.4	2	2.4
Retired	0		2	2.4
Salesman	14	4.3	2	2.4
Saloon-keeper	6	1.8	0	
Teamster	15	4.6	0	
Waiter	1	.3	1	1.2
Not stated	0		0	
Total	328	99.9	83	100.0

are found more frequently in the X_2 than in the X_1 group. Manufacturers and professional men constitute not more than 2 per cent of the X_1 group, but from 8 to 13 per cent of X_2. This list of occupations is found in the X_1 series but not in the X_2: artist, collector, detective, keeper of the ball grounds, pawnbroker, peddler, piano tuner, picture-show manager, reporter, saloon keeper, and teamster. Of these, saloon keepers and teamsters are found in numbers in X_1 but are not represented in X_2. This list of occupations is found in X_2 but not in X_1: banker, broker, landscape gardener, motion-picture exhibitor, stock keeper, and whiskey compounder. Of the six fathers who had retired, five were in X_2 and but one in X_1.

For the group of families in which the support of the father was lacking because of death, illness or desertion, the mothers' occupations are shown in the Table 655. The striking difference is, that the mothers of the X_2

TABLE 655

NO FATHER—MOTHERS' OCCUPATION

Occupation of Mother	Boys				Girls			
	X_1		X_2		X_1		X_2	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
No occupation	21	31.4	14	87.5	21	35.5	10	71.5
Washing	4	5.9	0		8	13.5	0	
Laundry hand	1	1.5	0		2	3.4	0	
Cleaning	11	16.4	0		5	8.5	0	
Domestic service	5	7.5	0		2	3.4	1	7.1
Boarding-house keeper	2	2.9	0		1	1.7	0	
Janitress	0		0		1	1.7	0	
Merchant	1	1.5	0		1	1.7	0	
Business manager	1	1.5	0		1	1.7	0	
Saleswoman	3	4.5	1	6.2	1	1.7	0	
Insurance agent	0		0		0		1	7.1
Office work	1	1.5	0		2	3.4	0	
Dressmaking and sewing	3	4.5	0		5	8.5	0	
Millinery	0		0		1	1.7	0	
Tailor shop	2	2.9	0		0		0	
Factory work	3	4.5	0		6	10.2	0	
Artist	1	1.5	0		0		0	
Commercial art	0		0		0		1	7.1
Dietitian	0		1	6.2	0		0	
Barmaid	1	1.5	0		0		0	
Dead (child with relatives)	6	8.9	0		1	1.7	1	7.1
Remarried (child with relatives)	1	1.5	0		0		0	
Unknown (child with relatives)	0		0		1	1.7	0	
Total	67	99.9	16	99.9	59	100.0	14	99.9

children were with few exceptions living at home and unemployed, while only a third of the mothers of X_1 children were at home and unemployed. The few mothers of X_2 children who were employed were, with the exception of one in domestic service, employed in the more skilled occupations—insurance agent, commercial art, saleswomen, and dietitian. The employed mothers of the X_1 group, on the other hand, were found in laundry work, house-cleaning, and domestic service more frequently than in the skilled occupations.

The difference in religious affiliations is shown in Tables 656 and 657. In both sexes the Jews constitute the smallest group in the X_1 series, the Catholics the second group, and the Protestants the largest group. In the X_2 series, the Catholics have become the smallest group in both sexes, the Jews the second group, and the Protestants third. In round numbers, there are in the X_1 series about 12 per cent Jews, about 20 per cent Catholics, and something over 60 per cent Protestants. In the X_2 series there are about 15 per cent Jews, only 8 per cent Catholics, and over 70 per cent Protestants. Since we do not know accurately the total number of families of each religion from these various districts, it is scarcely safe to make an interpretation of these facts.

Tables 658 and 659 give the facts about the birthplace of the parents in the two groups. The X_2 series of both sexes contain many more families in which both parents were American-born, and fewer in which both parents were foreign-born, than the X_1 series. In round numbers, the X_1 series contains about 54 per cent of families in which both parents were American, and the X_2 series about 68 per cent. The X_1 series has about 27 per cent of families in which both parents were foreign-born, and the X_2 series about 12 per cent. The language of the home (Tables 660 and 661) is English in about 90 per cent of the families of the X_1 series and in about 95 per cent of the X_2 series.

The statistics with regard to the proportion of mothers employed outside of the home (Tables 662 and 663) are open to the same criticism of incompleteness as in the previous section. Assuming, as we did before and for the same reasons, that the positive answers are approximately correct, the tables show more working mothers among the boys of the X_1 series (19 per cent) than among those of the X_2 series (1 per cent), but among the girls about the same proportion in the two series (16 per cent). The X_1 series, both boys and girls, have a larger number of instances of lodgers in the home than the X_2 series. In terms of number of rooms occupied (Tables 666 and 667), the differences between the two series come in the extremes. There are practically no children of the X_2 group living in one or two rooms, while there are 12 per cent of the boys and 14 per cent of the girls in the X_1 series in one- or two-room tenements. There are also more of the X_2 series than of the X_1 series in the very large houses of nine rooms

TABLE 656

RELIGIOUS AFFILIATION

Boys

	X_1		X_2	
	No.	Per Cent	No.	Per Cent
Jewish . . .	43	10.2	19	16.5
Catholic . .	102	24.3	9	7.8
Protestant .	258	61.4	87	75.7
No record .	17	4.0	0	.0
Total . .	420	99.9	115	100.0

TABLE 657

RELIGIOUS AFFILIATION

Girls

	X_1		X_2	
	No.	Per Cent	No.	Per Cent
Jewish . . .	45	13.7	12	14.5
Catholic . .	55	16.8	7	8.4
Protestant .	219	66.8	59	71.1
No record .	9	2.7	5	6.0
Total . .	328	100.0	83	100.0

TABLE 658

BIRTHPLACE OF PARENTS

Boys

	X_1		X_2	
	No.	Per Cent	No.	Per Cent
Both American	221	52.6	82	71.3
F. foreign. .	48	11.4	10	8.7
M. foreign . .	33	7.8	3	2.6
Both foreign	110	26.2	17	14.8
No record .	8	1.9	3	2.6
Total . .	420	99.9	115	100.0

TABLE 659

BIRTHPLACE OF PARENTS

Girls

	X_1		X_2	
	No.	Per Cent	No.	Per Cent
Both American	186	56.7	55	65.5
F. foreign. .	27	8.2	10	12.0
M. foreign .	24	7.3	7	8.4
Both foreign	90	27.5	9	10.8
No record .	1	.3	2	2.4
Total . .	328	100.0	83	99.1

TABLE 660

LANGUAGE OF THE HOME

Boys

	X_1		X_2	
	No.	Per Cent	No.	Per Cent
English . .	371	88.3	111	96.5
Foreign . .	47	11.2	4	3.5
No record .	2	.5	0	.0
Total . .	420	100.0	115	100.0

TABLE 661

LANGUAGE OF THE HOME

Girls

	X_1		X_2	
	No.	Per Cent	No.	Per Cent
English . .	302	92.1	78	94.0
Foreign . .	24	7.3	5	6.0
No record .	2	.6	0	.0
Total . .	328	100.0	83	100.0

TABLE 662

MOTHER WORKING

Boys

	X_1		X_2	
	No.	Per Cent	No.	Per Cent
Yes	78	18.6	1	.9
No	261	62.1	50	43.5
No record .	81	19.3	64	55.6
Total . .	420	100.0	115	100.0

TABLE 663

MOTHER WORKING

Girls

	X_1		X_2	
	No.	Per Cent	No.	Per Cent
Yes	51	15.5	14	16.9
No	182	55.5	37	44.6
No record .	95	29.0	32	38.5
Total . .	328	100.0	83	100.0

TABLE 664

LODGERS IN THE HOME

Boys

	X_1		X_2	
	No.	Per Cent	No.	Per Cent
Yes	62	14.8	3	2.6
No	300	71.4	64	55.7
No record .	58	13.8	48	41.7
Total . .	420	100.0	115	100.0

TABLE 665

LODGERS IN THE HOME

Girls

	X_1		X_2	
	No.	Per Cent	No.	Per Cent
Yes	31	9.5	3	3.6
No	253	77.1	18	21.7
No record .	44	13.4	62	74.7
Total . .	328	100.0	83	100.0

TABLE 666

ROOMS OCCUPIED

Boys

No. of Rooms	X_1		X_2	
	No.	Per Cent	No.	Per Cent
1	7	1.7	0	.0
2	45	10.7	0	.0
3	98	23.3	54	47.0
4	88	21.0	5	4.3
5	54	12.9	9	7.8
6	53	12.6	7	6.1
7	24	5.7	10	8.7
8	22	5.2	5	4.3
9 and over .	26	6.2	14	12.2
No record .	3	.7	11	9.6
Total . . .	420	100.0	115	100.0

TABLE 667

ROOMS OCCUPIED

Girls

No. of Rooms	X_1		X_2	
	No.	Per Cent	No.	Per Cent
1	0	.0	0	.0
2	46	14.0	1	1.2
3	72	22.0	1	1.2
4	65	19.8	2	2.4
5	49	14.9	7	8.4
6	36	10.9	7	8.4
7	18	5.5	2	2.2
8	14	4.2	2	2.4
9 and over .	18	5.5	11	13.3
No record .	10	3.0	50	60.2
Total . . .	328	99.8	83	99.7

TABLE 668

SCHOOLS ATTENDED

Boys

No. of Schools	X_1		X_2	
	No.	Per Cent	No.	Per Cent
1	63	15.0	46	40.0
2	166	39.5	32	27.8
3	97	23.1	19	16.5
4	64	15.2	9	7.8
5	20	4.8	2	1.7
6	8	1.9	0	.0
7 and over .	1	.2	2	1.7
No record .	1	.2	5	4.4
Total . . .	420	99.9	115	99.9

TABLE 669

SCHOOLS ATTENDED

Girls

No. of Schools	X_1		X_2	
	No.	Per Cent	No.	Per Cent
1	48	14.6	16	19.3
2	128	39.0	27	32.5
3	93	28.4	22	26.5
4	38	11.6	10	12.0
5	11	3.4	5	6.0
6	2	.6	1	1.2
7 and over .	8	2.4	0	.0
No record .	0	.0	2	2.4
Total . . .	328	100.0	83	99.9

or more. The children of the X_2 group prove to be more stable in their school careers than those of the X_1 group (Tables 668 and 669). There is a larger percentage of both boys and girls who had attended but one elementary school in the X_2 group than in the X_1 group.

It is evident that in most of the social factors considered, particularly those that seem to be related to normal school progress and to remaining in school, the X_1 group falls between the M group and the X_2 group. The summaries in Table 670 will illustrate the point.

It now becomes of interest to note whether the three groups—working, first school, and second school—bear the same relation to one another in mental and physical development that they do in social factors. To serve as a basis of judgment on this point, the differences between the average percentile ranks of the school group as a whole and the working group have been compared with the differences between the average percentile ranks of the two school groups in both mental and physical tests. Tables 671 and 672 present these differences.

When the size of the difference in percentile rank between the two school groups is compared with that between working and school children, it is evident that the two school groups lie relatively very close together and far removed from the working group. In many instances the differences between the two school groups are so small as to be of doubtful significance, while the difference between working and school groups is unmistakable in every series. This is in marked contrast to the relation of the three groups in social factors, where the X_1 group lies, in most instances, not close to the X_2 group, but part way between the M and the X_2 groups. Our conclusion is that the ability of the children has been a more potent factor in keeping them in school than social and economic conditions, though undoubtedly both have played a part.

The tables furnish a basis for some other interesting comparisons. In physical ability, the boys from the better social status (X_2) are a little superior to those from the poorer social status (X_1), while the reverse is true of girls (Table 671). It was also true (see Chapter V) that school boys were superior in size to working boys, while school girls were not superior to working girls. We seem justified in concluding that a superior social status tends to foster physical development for boys to a much greater extent than it does physical development for girls. Perhaps the social ideals of size and strength and physical skill for men and of delicacy and a bit of helplessness for women are still affecting the lives of children of superior social status.

The table dealing with mental status (Table 672) indicates once more that boys who remain in school, and particularly those from an inferior social status, are more highly selected on the basis of mental ability than girls who remain in school. In other words, while girls from the poorer social levels seem to be kept in school for a variety of reasons not related to their ability, boys are much more apt to be selected for school primarily on the basis of ability. The tables offer two bits of evidence for this fact. In the first place, school boys are more superior to working boys than

TABLE 670

COMPARISON OF WORKING CHILDREN, FIRST SCHOOL GROUP AND SECOND SCHOOL GROUP IN SOCIAL FACTORS

a. Percentage of Religious Group

Boys				Girls			
	M	X_1	X_2		M	X_1	X_2
Jewish	2.4	10.2	16.5	Jewish	1.2	13.7	14.5
Catholic	56.9	24.3	7.8	Catholic	43.3	16.8	8.4
Protestant	33.8	61.4	75.7	Protestant	36.9	66.8	71.1

b. Percentage of Foreign-born Parents

Boys				Girls			
	M	X_1	X_2		M	X_1	X_2
Both American . . .	23.1	52.6	71.3	Both American. . .	32.3	56.7	65.5
F. foreign.	9.7	11.4	8.7	F. foreign	12.8	8.2	12.0
M. foreign	10.7	7.8	2.6	M. foreign	9.4	7.3	8.4
Both foreign	53.3	26.2	14.8	Both foreign	44.8	27.5	10.8

TABLE 670—*Continued*

c. Percentage of Mothers Employed

Boys				Girls			
	M	X_1	X_2		M	X_1	X_2
Yes	26.3	18.6	.9	Yes	38.7	15.5	16.9
No	72.7	62.1	43.5	No	58.5	55.5	44.6
No record	1.0	19.3	55.6	No record	2.7	29.0	38.5

d. Percentage of Those Living in One or Two Rooms

Boys				Girls			
Series	M	X_1	X_2	Series	M	X_1	X_2
Percent	22.2	12.4	0.0	Percent	21.9	14.0	1.2

TABLE 671

DIFFERENCES BETWEEN AVERAGE PERCENTILE RANKS—PHYSICAL

Boys

X—M					X_2—X_1		
14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	16 yrs.	17 yrs.	18 yrs.
13.8	15.4	12.9	12.0	12.7	+3.1	−1.7	+4.5
15.3	15.2	14.7	11.1	12.4	+1.7	−0.5	+9.5
14.4	17.0	16.1	11.8	12.7	+0.1	+3.0	+3.0
15.3	17.0	17.0	12.7	12.3	−0.9	+2.4	+0.2
16.1	17.4	17.6	12.3	11.6	−1.5	+4.4	+0.4
16.8	19.0	16.8	13.1	11.2	−1.2	+5.2	+2.1
16.2	20.8	16.2	13.1	9.6	−1.3	+4.9	+3.9
16.4	22.1	15.1	14.9	8.8	+0.1	+2.5	+3.7
16.0	20.7	11.2	9.8	7.4	+1.6	+0.9	+0.1

Girls

X—M					X_2—X_1		
14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	16 yrs.	17 yrs.	18 yrs.
11.1	10.3	9.8	9.8	9.4	+1.4	−5.2	+4.2
14.5	12.6	11.4	10.6	12.8	+5.1	−2.5	−0.2
15.2	14.2	10.8	9.2	8.8	+2.3	−2.1	−0.6
15.0	13.9	11.2	8.8	6.4	+1.7	−4.7	−1.1
14.2	14.3	10.8	9.6	5.1	+0.4	−2.3	+0.8
14.3	15.0	10.8	8.6	7.5	0.0	−3.2	0.0
15.4	14.6	10.4	7.5	6.5	+1.3	−2.7	−3.1
14.3	14.2	8.6	6.7	4.1	−1.2	−1.3	−1.9
12.8	13.4	7.1	7.6	3.9	−4.3	−2.2	+1.1

school girls are to working girls (see also Chapter V). In the second place, there is but a small difference in mental rating between boys from an inferior (X_1) and those from a superior social level (X_2), while there is a much larger difference in favor of girls from the higher social level. Indeed, in the case of boys, the superiority in mental ability in the top fifth of the scale is with the boys of the inferior rather than with those from the superior social levels. We must conclude that while the X_1 boys were highly selected on the basis of mental ability, and therefore compare favorably with the boys of X_2 who come from districts where staying in school is the rule and where the general mental level is high, the girls from X_1 were much less highly selected on this basis, and therefore compare less favorably with the mental level of girls in the favored X_2 group.

The writer knows of no studies closely comparable to this one in showing the contrast between working and school children in various social factors.

TABLE 672

DIFFERENCES BETWEEN AVERAGE PERCENTILE RANKS—MENTAL

Boys

X—M					X_2—X_1		
14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	16 yrs.	17 yrs.	18 yrs.
14.8	11.8	17.7	19.1	27.7	+0.6	+6.1	+19.7
12.4	17.7	17.7	20.9	35.0	+0.6	+5.6	+ 1.2
13.9	17.8	17.3	22.8	23.5	+1.6	+5.6	+ 1.3
13.0	17.6	18.0	23.8	21.9	−0.5	+4.0	+ 1.3
12.6	17.5	18.0	22.5	20.3	−2.2	+2.2	+ 2.3
12.3	17.6	17.5	20.3	18.6	−3.0	+1.6	+ 2.4
10.9	17.5	16.8	18.8	17.5	−3.5	+1.2	+ 1.1
8.8	17.6	17.6	17.5	14.4	−4.6	−0.4	− 1.3
7.2	14.4	13.7	16.3	9.7	−4.7	−2.5	− 0.3

Girls

X—M					X_2—X_1		
14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	16 yrs.	17 yrs.	18 yrs.
11.5	14.0	14.9	24.2	23.4	+8.5	+6.9	+2.8
10.6	14.1	14.4	24.3	22.2	+5.8	+6.8	+4.2
12.3	12.8	17.1	24.2	20.8	+3.3	+6.8	+4.6
12.1	12.8	16.7	24.1	21.5	+2.5	+5.6	+2.8
11.6	15.1	16.2	23.0	21.5	+1.4	+5.6	+2.7
11.2	14.6	15.2	22.6	20.2	+0.7	+6.1	+2.0
10.8	13.5	13.8	22.4	18.3	+0.1	+5.8	+1.7
8.9	13.0	13.5	20.2	15.4	−1.9	+3.3	+0.2
7.6	13.2	15.6	17.2	17.3	+1.4	+2.0	+2.1

The facts brought out are in accord with common opinion, but the basis of fact underlying common opinion is always worth obtaining.

Two studies touching upon the material of this chapter may be mentioned. Kornhauser (1) studied the relation between the economic standing of the parents and the intelligence of the children. In his study, the economic standing of the parents was determined by the presence or absence of a telephone, and the intelligence of the children by their school grade attainment. He found the children who were advanced in school possessing most telephones and those who were retarded, fewest. His conclusion is that parents of superior economic status have children of superior ability. Pressey and Ralston (2) studied the relation between general intelligence and the occupation of the father. Occupations were divided into four groups: professional, executive, artisan, and laborer. To avoid having his results influenced by withdrawal from school, Pressey took the group between ten and fourteen years of age. There were 548 children in this group. Intelligence was measured by the Pressey cross-out tests. He found that the children of professional fathers had records much above average, those of executive fathers above average, those of artisan fathers below average, and those of laboring fathers, still more below average. When he studied the proportion of the children in the four groups whose records fell in the highest and lowest 10 per cent, he found the expected result. Most of the professional group and fewest of the laboring group fell in the highest 10 per cent, and the reverse obtained in the lowest 10 per cent. However, while but 1 per cent of the children of professional men fell in the lowest 10 per cent, there were 6 per cent of the children of laborers who fell in the top 10 per cent. The general conclusion is in accord with the present study, though the results are not directly comparable. Among our working children were found practically no members of professional families. They were in the upper grades of the school group, in which mental and educational status was highest. Nevertheless, some children as promising as those from professional families both in mental tests and in school grade attainment were found among the working children. There seems to be plenty of unrecognized and undeveloped ability left in the community.

References

(1) Kornhauser, A. W.—"The Economic Standing of Parents and the Intelligence of Children," *Journal of Educational Psychology*, 1918, IX, 159–164.

(2) Pressey, S. L. and Ralston, R.—"The Relation of the General Intelligence of School Children to the Occupations of Their Fathers," *Journal of Applied Psychology*, 1919, III, 366–373.

CHAPTER XIII

HOME CONDITIONS

The Numerical Scale for Rating Homes

No study of a group of children, or indeed of an individual child, is complete without a knowledge of home conditions. On the other hand, no material is more difficult to reduce to a numerical basis than home conditions. However, in order to make comparisons between estimates of home conditions and other factors, the attempt had to be made. After completing a large number of home visits, a schedule was worked out in which various factors of home life were assigned values which, when added, equaled one hundred. The five points selected for separate estimate, and the values assigned to each, are as follows:

1.	General Status of the Family	10
2.	Neighborhood	15
3.	Industrial Status of the Family	20
4.	Material Conditions of the Home	25
5.	Home Atmosphere and Parental Attitude	30
		100

The assignment of numerical values to the various factors of home conditions cannot, of course, claim a scientific foundation. All we can say is that the values assigned represented the relative importance of the various elements of home life as judged by the workers who made the home visits.

Each of the families visited was given a rank of *very poor*, *poor*, *fair*, or *good* on each of the five points of the estimate. To furnish a constant basis of judgment and more uniformity in the estimates, each of these grades was assigned a numerical value. The method will become clear in discussing the grading of each of the five elements of the total estimate.

GENERAL STATUS OF THE FAMILY

By general status of the family is meant whether the constitution of the family is normal, with the parents living and supporting the children, and the health conditions reasonably good. A full value of 10 is given in case these simple requirements are met. If the health conditions in the family are very bad, 4 or 5 points are deducted. If one or both parents are ill or the child has had habitually poor health, 2 or 3 points are deducted. If one parent is dead or deserted, 2 or 3 points are deducted. If one parent is dead but a good step-parent has entered the family, not more than 1 point is deducted. When the child is living with guardians, from 1 to 4 points are deducted according to the nature of the care furnished.

In assigning the values *very poor, poor, fair,* and *good* to homes, the ten points were divided as follows:

Very poor	*Poor*	*Fair*	*Good*
1–4	5–6	7–8	8–10

NEIGHBORHOOD

The neighborhood is rated as *good* when it is a pleasant residential district such as a business man might select. If the district is one with good tenements and plain, humble homes, it is considered *fair.* Where the neighborhood is chiefly tenements which are shabby and run-down, the classification is *poor.* If the district is very forlorn or immoral, the neighborhood is classified as *very poor.* In general districts which are industrial in part are classed lower than those which are purely residential. The numerical values assigned to the ratings are as follows:

Very poor	*Poor*	*Fair*	*Good*
1–6	7–9	10–12	13–15

INDUSTRIAL STATUS OF THE FAMILY

It may appear at first sight that the value given to the industrial status of the family—20—is too low. It must be remembered, however, that industrial status is necessarily reflected both in the material conditions of the home and in the atmosphere of the home, each of which has a separate rating. Furthermore, it was very evident that industrial status alone did not determine the quality of the home. There are very good homes of poor industrial status, and very poor homes of good industrial status—points which will be illustrated later.

The estimates of family income are all made without including the child's earnings, since our point was to determine whether without the aid of the child the family could have maintained a minimum efficiency of living. One's judgment of the necessity of child labor depends upon this point. A complete table showing what estimate should be given to each per-capita income has been worked out and is presented as part of this section (Table 673). Meanwhile the general rules which govern the estimate can be stated. If there is no economic pressure and the family owns its own home, the full estimate of 20 is given no matter what the size of the family income. If the home seems to be without pressing need and the family able to save something, or if the family owns its own home and the father has a superior type of work, the estimate is *fair* or *good.* Families whose per-capita allowance for food is as much as $2.00 a week are rated as at least *fair* in economic status. If the mother is not working and there are few younger children and if after the rent is paid there is $3.00 per

TABLE 673

TABLE OF VALUES ASSIGNED ON THE BASIS OF PER-CAPITA INCOMES OF FAMILIES OF DIFFERENT SIZES

	Three Members in Family	Four Members in Family	Five Members in Family	Six Members in Family	Seven Members in Family	Eight Members in Family	Nine Members in Family
Very poor . .	$1.59= 4	— 1.29= 4	— 1.16= 4	— 1.04= 4	— .98= 4		
	$1.60— 1.84= 5	1.30— 1.49= 5	1.17— 1.32= 5	1.05— 1.17= 5	.99— 1.09= 5		
	$1.85— 2.09= 6	1.50— 1.69= 6	1.33— 1.48= 6	1.18— 1.31= 6	1.10— 1.21= 6		
	$2.10— 2.34= 7	1.70— 1.89= 7	1.49— 1.64= 7	1.32— 1.45= 7	1.22— 1.33= 7		
	$2.35— 2.59= 8	1.90— 2.09= 8	1.65— 1.80= 8	1.46— 1.60= 8	1.34— 1.46= 8		
Poor	$2.50— 3.09= 9	2.10— 2.50= 9	1.81— 2.16= 9	1.61— 1.92= 9	1.47— 1.75= 9	1.37— 1.62= 9	— 1.42= 9
	$3.10— 3.59=10	2.51— 2.90=10	2.17— 2.51=10	1.93— 2.24=10	1.76— 2.04=10	1.63— 1.88=10	1.43— 1.63=10
	$3.60— 4.09=11	2.91— 3.30=11	2.52— 2.85=11	2.25— 2.54=11	2.05— 2.33=11	1.89— 2.14=11	1.64— 1.84=11
	$4.10— 4.60=12	3.31— 3.73=12	2.86— 3.21=12	2.55— 2.86=12	2.34— 2.61=12	2.15— 2.41=12	1.85— 2.27=12
Fair	$4.61— 5.05=13	3.74— 4.09=13	3.22— 3.52=13	2.87— 3.15=13	2.62— 2.87=13	2.42— 2.64=13	2.28— 2.44=13
	$5.06— 5.50=14	4.10— 4.45=14	3.53— 3.84=14	3.16— 3.43=14	2.88— 3.13=14	2.65— 2.87=14	2.45— 2.61=14
	$5.51— 5.95=15	4.46— 4.81=15	3.85— 4.16=15	3.44— 3.71=15	3.14— 3.39=15	2.88— 3.11=15	2.62— 2.78=15
	$5.96— 6.40=16	4.82— 5.19=16	4.17— 4.49=16	3.72— 3.99=16	3.40— 3.64=16	3.12— 3.36=16	2.79— 2.84=16
Good	$6.41— 7.20=17	5.20— 5.84=17	4.50— 5.24=17	4.00— 4.66=17	3.65— 4.26=17	3.37— 3.93=17	2.85— 2.95=17
	$7.21— 8.00=18	5.85— 6.49=18	5.25— 5.99=18	4.67— 5.32=18	4.27— 4.88=18	3.94— 4.50=18	2.96— 3.43=18
	$8.01— 8.80=19	6.50— 7.14=19	6.00— 6.74=19	5.33— 5.99=19	4.89— 5.49=19	4.51— 5.09=19	3.44— 3.91=19
	$8.81— 9.60=20	7.15— 7.80=20	6.75— 6.99=20	6.00— 6.60=20	5.50— 6.11=20	5.10— 5.66=20	3.92— 4.40=20

capita remaining, the home is also considered *fair*. If there is real financial strain and the standards are below those outlined above, the home is rated as *poor*. If the income is obviously below the point of maintaining a decent minimum standard of living, the rating is *very poor*. The numerical values assigned to the various ratings are:

Very poor	*Poor*	*Fair*	*Good*
1–8	9–12	13–16	17–20

Wherever it was possible to obtain accurate data about income and expenditure, the judgment of economic status was made on the basis of per-capita income. In interpreting the table of incomes, it is necessary to bear in mind the fact that the schedule was made out for the years 1912 and 1913, when most of the visiting was done. Not only was the cost of living very different from that of the present, but the data available for making estimates of minimum living wages was very much less adequate than at present. The guides we used in making up the table of estimates which appears below were the data of the Associated Charities of Buffalo with regard to the cost of living, and the figures furnished by Kennedy, based on studies made of families in the Chicago Stock Yards, with regard to the per-capita cost of living for families of various size. Corrections for Cincinnati were necessary, since the cost of rent and food was somewhat greater there than for Buffalo or Chicago. The ratio was 92:88. In the table a numerical value has been assigned to per-capita incomes according to the size of the family. These were the values used in rating homes in cases where the exact size of the family income was known.

MATERIAL CONDITIONS OF THE HOME

The rules for numerical estimates of the material conditions of the home are of a more general nature. The points considered were order and cleanliness, sanitation, and congestion. If the average number of persons to a room was two or more, the rating was not above *fair* no matter how clean and orderly the house. Under sanitation, the location of the water supply, the type of toilet, and ventilation were considered. The ratings assigned were as follows:

Very poor	*Poor*	*Fair*	*Good*
1–10	11–15	16–20	21–25

HOME ATMOSPHERE AND PARENTAL ATTITUDE

The atmosphere of the home and the attitude of the parents toward the children is the factor which in our judgment deserves most weight of all in estimating the quality of a home. The following considerations guided our judgment in assigning numerical values. If the parents are intelligent and moderately well educated, ambitious for the child, successful in maintaining a wholesome parental control, and if the home atmosphere is cheerful and healthful, the full value of 30 was assigned. If the parents are lacking in interest, in education, and in ambition for the child, if their ideals are mediocre and their knowledge of the child incomplete, the estimate is *fair*. If the parents are indifferent to the welfare of the child himself and regard him chiefly as an asset, if parental control is poor, and if there is friction and unhappiness in the home, the rating is *poor*. If the parents are very ignorant and of low moral standards so that the influence of the home is distinctly deteriorating, the estimate is *very poor*. The numerical values are as follows:

TOTAL RATING OF HOMES

Very poor	*Poor*	*Fair*	*Good*
1–12	13–18	19–24	25–30

A summary of the various values assigned is presented below:

	Very poor	*Poor*	*Fair*	*Good*
1. General Status of Family (physical and parental)	1– 4	5– 6	7– 8	9–10
2. Neighborhood	1– 6	7– 9	10–12	13–15
3. Economic Status	1– 8	9–12	13–16	17–20
4. Material Conditions	1–10	11–15	16–20	21–25
5. Home Atmosphere and Parental Attitude	1–12	13–18	19–24	25–30
	40	60	80	100

The upper limits of the four ratings for the five points considered add up to *very poor*, 40; *poor*, 60; *fair*, 80; and *good*, 100. Accordingly the total estimate of the home, made in each case by adding the values assigned to the five separate points, has been graded as follows:

Very poor	40 and below
Poor	41– 60
Fair	61– 80
Good	81– 90
Very good	91–100

HOME RATINGS OF WORKING CHILDREN

Among the working children we have records complete enough to make a numerical estimate for the homes of 343 boys and 257 girls. These visits were made between 1912 and 1915, before the war had had any effect on our local conditions. Visits to the homes of school children were begun, but unfortunately were never completed. We have records in the school group for only 67 boys and 62 girls. Those homes belonged to children who were tested very early in the school series and therefore came from exactly the same neighborhoods as the working children. Limitations of money and energy prevented the completion of this part of the total task.

The results for the 600 homes of working children will be presented first under the five separate headings, and then according to the total estimate. All the tables are classified by school grade completed.

TABLE 674

HOME RATINGS — SEPARATE FACTORS

Boys

a. Family Status (10 Points)

Points	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1– 4	4	4.1	2	1.9	3	3.2	0	.0	9	2.6
5– 6	13	13.1	11	10.7	10	10.7	4	8.3	38	11.0
7– 8	33	33.3	39	38.2	24	25.5	16	33.3	112	32.6
9–10	49	49.4	50	49.0	57	60.6	28	58.3	184	53.6
Total. . . .	99	99.9	102	99.8	94	100.0	48	99.9	343	99.8

b. Neighborhood (15 Points)

Points	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1– 6	8	8.1	3	2.9	10	10.6	2	4.1	23	6.7
7– 9	36	36.3	36	35.3	23	24.4	16	33.3	111	32.3
10–12	46	46.4	45	44.1	44	46.8	21	43.6	156	45.4
13–15	9	9.1	18	17.6	17	18.0	9	18.7	53	15.4
Total. . . .	99	99.9	102	99.9	94	99.8	48	99.7	343	99.8

c. Industrial Status (20 Points)

Points	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1– 8	15	15.1	7	6.8	4	4.2	4	8.3	30	8.7
9–12	27	27.2	27	26.4	24	25.5	14	29.1	92	26.8
13–16	33	33.3	37	36.2	32	34.0	17	35.4	119	34.8
17–20	24	24.2	31	30.4	34	36.1	13	27.0	102	29.7
Total. . . .	99	99.8	102	99.8	94	99.8	48	99.8	343	100.0

d. Material Conditions of the Home (25 Points)

Points	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1–10	6	6.1	10	9.8	10	10.6	3	6.2	29	8.4
11–15	21	21.1	14	13.7	15	15.8	6	12.5	56	16.3
16–20	56	56.5	57	55.8	36	38.3	22	45.8	171	49.8
21–25	16	16.1	21	20.5	33	35.1	17	35.4	87	25.3
Total. . . .	99	99.8	102	99.8	94	99.8	48	99.8	343	99.8

TABLE 674—*Continued*

e. PARENTAL ATTITUDE (30 POINTS)

POINTS	GRADE V		GRADE VI		GRADE VII		GRADE VIII		TOTAL	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1–12	10	10.1	8	7.8	5	5.3	1	2.0	24	6.9
13–18	24	24.2	26	25.4	16	17.0	7	14.5	73	21.2
19–24	40	40.1	31	30.4	35	37.2	13	27.0	119	34.6
25–30	25	25.2	37	36.2	38	40.4	27	56.2	127	37.0
Total. . . .	99	99.6	102	99.8	94	99.9	48	99.7	343	99.7

GENERAL STATUS OF FAMILY

The summary of family status is presented in Tables 674a and 675a. The number of families rated as *poor* or *very poor* in any grade is low. In most grades those rated as *good* constitute a larger group than any other. We can say roughly that about half of the families were normal in status with both parents living and no irregularities in the family organization. There is evident in both tables a relation to school grade. The children in the fifth grade have a larger proportion of inferior homes than any other. The two upper grades show a decided superiority to the two lower ones in both sexes. The number of very poor homes is exceedingly small. It constitutes only seven among the girls and nine among the boys—in each case about 2½ per cent.

NEIGHBORHOOD

The estimates of neighborhood are presented in Tables 674b and 675b. These tables show comparatively little relationship to school grade. Among the girls the eighth grade is clearly superior, and among the boys the fifth grade is somewhat inferior. Only about from 5 to 7 per cent of the children belong in very poor neighborhoods.

INDUSTRIAL STATUS

Estimates of industrial status show very little relationship to school grade (Tables 674c and 675c). Among the girls the eighth grade is superior and the fifth grade inferior. Among the boys there is exceedingly little difference from grade to grade.

MATERIAL CONDITIONS OF THE HOME

Tables 674d and 675d show the estimates of the material conditions of the home, and show that the two upper grades have better homes than the two lower ones, though it cannot be said that there is a perfectly regular progression from grade to grade.

TABLE 675 — HOME RATINGS — SEPARATE FACTORS

Girls

a. Family Status (10 Points)

Points	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1– 4	3	5.8	2	2.6	2	2.6	0	.0	7	2.8
5– 6	9	17.6	7	9.4	6	7.8	2	3.6	24	9.3
7– 8	23	45.1	31	41.9	32	41.6	20	36.3	106	41.3
9–10	16	31.3	34	45.9	37	48.0	33	60.0	120	46.7
Total	51	99.8	74	99.8	77	100.0	55	99.9	257	100.1

b. Neighborhood (15 Points)

Points	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1– 8	6	11.7	2	2.6	2	2.6	3	5.4	13	5.0
7– 9	12	23.5	23	31.0	14	18.0	10	18.1	59	22.9
10–12	24	47.0	38	51.3	50	64.9	23	41.8	135	53.0
13–15	9	17.6	11	14.8	11	14.2	19	34.4	50	19.4
Total	51	99.8	74	99.7	77	99.7	55	99.7	257	100.3

c. Industrial Status (20 Points)

Points	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1– 8	3	5.8	3	4.0	4	5.1	1	1.8	11	4.3
9–12	23	45.1	16	21.5	25	32.4	11	20.0	75	29.2
13–16	14	27.4	30	40.5	30	38.9	24	43.6	98	38.1
17–20	11	21.5	25	33.8	18	23.3	19	34.5	73	28.4
Total	51	99.8	74	99.8	77	99.7	55	99.9	257	100.0

d. Material Conditions of the Home (25 Points)

Points	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1–10	7	13.7	3	4.0	3	3.8	1	1.8	14	5.4
11–15	9	17.6	14	18.9	12	15.6	6	10.9	41	15.9
16–20	23	45.1	41	55.4	39	50.7	25	45.4	128	49.8
21–25	12	23.5	16	21.6	23	29.8	23	41.8	74	28.0
Total	51	99.9	74	99.9	77	99.9	55	99.9	257	99.1

TABLE 675—*Continued*

e. PARENTAL ATTITUDE (30 POINTS)

POINTS	GRADE V		GRADE VI		GRADE VII		GRADE VIII		TOTAL	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1–12	6	11.7	6	8.1	3	3.8	1	1.8	16	6.2
13–18	16	31.3	20	27.0	14	18.0	4	7.2	54	21.0
19–24	20	39.2	28	37.8	33	42.8	30	54.5	111	43.1
25–30	9	17.6	20	27.0	27	35.0	20	36.3	76	29.5
Total	51	99.8	74	99.9	77	99.6	55	99.8	257	99.8

HOME ATMOSPHERE AND PARENTAL ATTITUDE

Tables 674e and 675e, estimating home atmosphere and parental attitude, show a far more definite and consistent relation to school grade than any of the others. There is a regular improvement from grade to grade, both among the boys and among the girls.

A STUDY OF HOMES OF SMALL INCOME RATED AS *GOOD* AND OF HOMES OF LARGE INCOME RATED AS *POOR*

That home atmosphere and attitude of the parents should have a decided relation to progress in school is very understandable. It seems at first surprising that the industrial status of the family should have so comparatively little relation to school progress. It is, of course, true on the whole that the homes with the higher incomes were the better homes, though even this relationship does not always hold. It seemed worth while to make a study of the cases of families of very small incomes whose homes were rated as *good*, and those of large incomes whose homes were rated as *poor*. The consideration of these extremes will help to explain why the general relationship between family income and school progress is so relatively small.

In our total list of homes there were twenty-one with small incomes ranked as *good*, and nine homes with large incomes ranked as *poor*. An account of some of these extreme instances will help to explain the conditions. One family of six people had an income of $10.00 a week making a per-capita income of $1.66. The father of the family had tuberculosis and could earn little or nothing. The income was earned by the children. The mother was a cheerful thrifty woman who performed successfully the well-nigh superhuman task of providing for her family, keeping the home neat and the atmosphere happy and stimulating on this incredibly small sum. In another case, a family of ten people were living on an income of $18.50 a week. They lived in a small brick cottage for which they paid $15.00 a month. It was in good condition, had a small neat yard and good light and ventilation. They spent $10.00 a week for food, and paid $1.10 for insurance. The furnishings of the house indicated better times in the past. Everything was neat and clean and orderly. Again a mother who is a genius as a manager makes the income do its utmost and maintains a cheerful atmosphere. It would be possible to multiply these instances, but the moral of the tale is the same in every case. The good home of very small income is always one where an intelligent capable mother makes every cent count to the utmost and at the same time keeps the spirit and morale of the home what it should be. Such a home is always favorable to school progress, no matter how small the income. Of course the same mother could make an even better home and give her children far more of a chance with a larger income.

Among the families of large incomes with *poor* homes was one in which the total income was $28.50 earned by four wage-earners for a family of

TABLE 676

SUMMARY OF HOME RATINGS

Boys

Points	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
40–	2	2.0	2	1.9	1	1.1	0	.0	5	1.5
41– 60	25	25.1	19	18.4	16	16.8	6	12.3	66	19.2
61– 80	52	52.4	55	53.7	42	44.4	26	54.0	175	51.0
81– 90	18	18.2	18	17.6	25	26.5	12	24.9	73	21.2
91–100	2	2.0	8	7.7	10	10.6	4	8.3	24	6.9
Total	99	99.7	102	99.3	94	99.4	48	99.5	343	99.8

TABLE 677

SUMMARY OF HOME RATINGS

Girls

Points	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
40–	2	3.9	0	.0	1	1.3	0	.0	3	1.1
41– 60	12	23.4	12	16.1	6	7.8	2	3.6	32	12.4
61– 80	32	62.5	48	64.7	48	62.2	30	54.3	158	61.4
81– 90	5	9.8	12	16.1	19	24.5	13	23.6	49	19.0
91–100	0	.0	2	2.6	3	3.8	10	18.1	15	5.8
Total	51	99.6	74	99.5	77	99.6	55	99.6	257	99.7

TABLE 678

HOME RATINGS — TOTAL SCORE

Boys — M

Points	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
40–	2	2.0	2	1.9	1	1.1	0	.0	5	1.4
41– 45	7	7.0	2	1.9	2	2.1	0	.0	11	3.2
46– 50	4	4.0	2	1.9	6	6.3	1	2.0	13	3.8
51– 55	4	4.0	2	1.9	2	2.1	1	2.0	9	2.6
56– 60	10	10.1	13	12.7	6	6.3	4	8.3	33	9.6
61– 65	8	8.1	12	11.7	9	9.5	5	10.4	34	9.9
66– 70	13	13.1	11	10.7	7	7.4	2	4.1	33	9.6
71– 75	19	19.1	14	13.7	9	9.5	10	20.8	52	15.1
76– 80	12	12.1	18	17.6	17	18.0	9	18.7	56	16.3
81– 85	10	10.1	13	12.7	17	18.0	7	14.5	47	13.7
86– 90	8	8.1	5	4.9	8	8.5	5	10.4	26	7.5
91– 95	2	2.0	6	5.8	7	7.4	4	8.3	19	5.5
96–100	0	.0	2	1.9	3	3.2	0	.0	5	1.4
Total	99	99.7	102	99.3	94	99.4	48	99.5	343	99.6
Median	70		74		76		76		73	

TABLE 679

HOME RATINGS — TOTAL SCORE

Girls — M

Points	Grade V		Grade VI		Grade VII		Grade VIII		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
40–	2	3.9	0	.0	1	1.3	0	.0	3	1.1
41– 45	2	3.9	1	1.3	0	.0	0	.0	3	1.1
46– 50	2	3.9	0	.0	0	.0	0	.0	2	.7
51– 55	4	7.8	6	8.1	6	7.8	0	.0	16	6.2
56– 60	4	7.8	5	6.7	0	.0	2	3.6	11	4.2
61– 65	8	15.6	8	10.8	8	10.4	4	7.2	28	10.9
66– 70	8	15.6	13	17.5	11	14.2	9	16.3	41	16.0
71– 75	9	17.6	16	21.6	12	15.6	7	12.7	44	17.1
76– 80	7	13.7	11	14.8	17	22.0	10	18.1	45	17.4
81– 85	5	9.8	9	12.1	14	18.0	7	12.7	35	13.6
86– 90	0	.0	3	4.0	5	6.5	6	10.9	14	5.4
91– 95	0	.0	2	2.6	3	3.8	9	16.3	14	5.4
96–100	0	.0	0	.0	0	.0	1	1.8	1	.4
Total	51	99.6	74	99.5	77	99.6	55	99.6	257	99.5
Median	67		71		75		78		72	

five, making a per-capita income of $5.70 a week. The family lived in three rooms in a poor tenement building, for which they paid $13.50 a month. There was nothing about the conditions of the home to recommend it. The mother was an ignorant woman, the father spoiled the children, and the spirit of the family was poor. Another family of four had an income of $19.85, making a per-capita income of $4.95 a week. They lived in two rooms in a poor tenement, for which they paid but $6.00 a month. The rooms were dirty and disorderly and the furnishings poor. The halls of the tenement were defaced with water, and the sink in the hall had overflowed. The mother of this family was a dispirited, pessimistic woman, who had no ambitions and few ideals. In the face of these drawbacks the large income availed nothing in advantage to a child.

A comparison of the expenditures of these two extreme groups for the necessities of life show that they do not differ much. The rent paid for the *good* homes with poor incomes averaged $12.47 a month, and that for the *poor* homes with good incomes $10.92 a month. The amount spent for food by the two groups varied between $1.00 and $2.00 per capita. In the *good* homes with poor incomes it was nearer $1.00, and in the *poor* homes with good incomes nearer $2.00. The *good* homes with poor incomes had a larger proportion of families who carried insurance than the reverse group, but the amount paid per week by the families who carried insurance was greater among the *poor* homes with large incomes. The habit of saving was more common among the *good* homes with poor incomes. Five of the twenty-one families in this group were in the habit of saving systematically,

TABLE 680

HOME RATINGS — TOTAL SCORE

Boys — X

	No.	Per Cent
40–	0	.0
41–45	1	1.5
46–50	1	1.5
51–55	3	4.4
56–60	5	7.4
61–65	8	11.9
66–70	5	7.4
71–75	8	11.9
76–80	13	19.4
81–85	15	22.4
86–90	5	7.4
91–95	3	4.4
Total	67	99.6
Median	76	

while but one of the nine families with *poor* homes and large incomes saved. The size of the families in the two groups differed but little. The average for the *good* homes with poor incomes was 5.3 and that for the *poor* homes with good incomes 6.5.

Since the difference in expenditures for the fundamental necessities of life differed so little in the two groups, we are forced to the conclusion that the surplus income of these *poor* homes was spent on clothes, incidentals, and various indulgences. While no one can deny that many of the good and desirable things of life—things that furnish the essential background for well-rounded human development—are dependent upon money, it still remains true that the quality of the human beings who make up the home—and particularly that of the mother—is an even more potent factor and one that may compensate for serious economic deficiencies. Perhaps, therefore, it is not surprising to find that while the economic background of the family has comparatively slight influence on school progress up to fourteen years, the attitude of the parents and the atmosphere of the home has much.

TOTAL RATINGS OF HOMES

The summaries by school grade which present the total estimates of the homes, made by adding the five separate estimates, are presented in Tables 676 and 677 in terms of the general rating of *very poor*, *fair*, *good*, and *very good*, and in Tables 678 and 679 in a finer distribution of values, from which a median has been figured. The rating tables for both boys and girls show a regular improvement with school grade in the sense that the *very poor* and *poor* homes become less in proportion with increasing school grade, and the *good* and *very good* homes greater in proportion. The school-grade differences when expressed in terms of the medians for each grade are surprisingly small. For the girls they are: fifth grade—67, sixth grade—71, seventh grade—75, and eighth grade—78. For the boys they are: fifth grade—70, sixth grade—74, seventh grade—76, and eighth grade—76.

Home Ratings of School Children

The data with regard to visits to the school group are so meager that they are of doubtful value. The cases were too few to allow of a school-grade summary. Tables 680 and 681 give the total summary for the estimate of the home as a whole and the median. The median is 78 for the girls and 76 for the boys. These medians for school children are the same as the corresponding ones for the eighth grade in the working group, but somewhat greater than the medians for the entire working group, which were 73 for boys and 72 for girls. The homes of the school children in question were all in exactly the same neighborhoods as those of the working group. Apparently the mere intention to remain in school beyond the age of fourteen is associated with a somewhat better type of home.

TABLE 681

HOME RATINGS — TOTAL SCORE

Girls — X

	No.	Per Cent
40–	0	.0
41– 45	0	.0
46– 50	0	.0
51– 55	0	.0
56– 60	4	6.4
61– 65	5	8.1
66– 70	8	12.9
71– 75	8	12.9
76– 80	11	17.7
81– 85	9	14.5
86– 90	10	16.1
91– 95	5	8.1
96–100	2	3.2
Total	62	99.9
Median	78	

CORRELATIONS OF HOME RATINGS WITH AVERAGE PERCENTILE RANKS IN MENTAL AND PHYSICAL TESTS

For the working group, for whom a single measure of physical ability and a single measure of mental ability, consisting in each case of an average of the average percentile ranks of the several years (from three to five years) was available, it seemed worth while to obtain a correlation between the standing in mental and physical tests, and home rating on the scale just described. The correlations were as follows:

	Boys	Girls
Home rating with average in physical tests	.10	.20
Home rating with average in mental tests	.03	.27

The surprising thing is that the correlations are all so small. In trying to interpret these correlations, one must bear in mind the group of children on whom they are based. These are children who had left the school permanently at fourteen years of age. There are two factors at work in this group which would tend to reduce the size of the correlations between ability and home rating. The group contains children of very limited intelligence, whose homes are good. These are children whose elimination from school is due entirely to poor ability, and whose type of home is that in which most of the children remain in school. At the other extreme are the children whose ability is good, but who belong in homes in which some sort of handicap has made for exceptionally poor home conditions and hence elimination from school. These are children whose ability would naturally keep them in school, but who are being forced out by poor home conditions. In other words, in the group of working children are found all those of very poor ability with good homes and all those of good ability with very poor homes. Correlations based upon the whole group, working and school children, would probably show higher values.

TABLE 682

MENTAL AVERAGES IN HOMES OF DIFFERENT GRADES

Boys

Home Rating	40	41–45	46–50	51–55	56–60	61–65	66–70	71–75	76–80	81–85	86–90	91–95	96–100	Average
Grade V	27 (2)	39 (7)	44 (4)	39 (4)	41 (10)	41 (8)	38 (13)	37 (19)	36 (12)	42 (10)	35 (9)	31 (2)	0	38
Grade VI	54 (2)	46 (2)	50 (2)	47 (2)	45 (13)	47 (12)	47 (11)	45 (14)	45 (17)	49 (13)	50 (5)	45 (6)	46 (2)	47
Grade VII	65 (1)	61 (2)	52 (6)	45 (2)	56 (6)	51 (9)	52 (7)	51 (9)	50 (17)	51 (17)	52 (8)	52 (7)	60 (3)	52
Grade VIII	0	0	55 (1)	68 (1)	71 (4)	52 (4)	43 (2)	63 (10)	52 (9)	60 (7)	60 (5)	52 (4)	0	58
Average	45	44	49	45	49	47	44	48	46	50	48	48	54	

Note.—Numbers in parentheses indicate number of cases.

TABLE 683

PHYSICAL AVERAGES IN HOMES OF DIFFERENT GRADES

Boys

Home Rating	40	41–45	46–50	51–55	56–60	61–65	66–70	71–75	76–80	81–85	86–90	91–95	96–100	Average
Grade V	34 (2)	35 (7)	39 (4)	37 (4)	43 (10)	44 (8)	43 (13)	44 (19)	36 (12)	47 (10)	41 (9)	44 (2)	0	42
Grade VI	51 (2)	44 (2)	61 (2)	46 (2)	45 (13)	46 (12)	49 (11)	42 (14)	41 (17)	43 (13)	50 (5)	45 (6)	30 (2)	45
Grade VII	65 (1)	54 (2)	45 (6)	49 (2)	45 (6)	51 (9)	49 (7)	39 (9)	48 (17)	47 (17)	54 (8)	57 (7)	57 (3)	49
Grade VIII	0	0	39 (1)	55 (1)	54 (4)	54 (4)	33 (2)	56 (10)	52 (9)	49 (7)	59 (5)	51 (4)	0	52
Average	47	40	45	42	46	48	46	45	44	46	50	51	46	

Note.—Numbers in parentheses indicate number of cases.

All of the correlations are positive. In spite, then, of the factors tending to reduce the size of correlations in this group, some positive relationship exists between good homes and mental and physical tests. In this series, the home seems more closely related to the mental and physical status of girls than it is to that of boys. Whether this is a real difference in the effect of home conditions on boys and girls, or the result of the selective processes at work in determining school leaving, it is difficult to say.

TABLE 684

MENTAL AVERAGES IN HOMES OF DIFFERENT GRADES

Girls

Home Rating	40	41–45	46–50	51–55	56–60	61–65	66–70	71–75	76–80	81–85	86–90	91–95	96–100	Average
Grade V	41 (2)	34.5 (2)	28 (2)	43 (4)	26 (4)	37 (8)	38 (8)	43 (9)	42 (7)	30 (5)				38
Grade VI		27 (1)		47 (6)	43 (5)	39 (8)	39 (13)	44 (16)	44 (11)	47 (9)	41 (3)	50 (2)		44
Grade VII	78 (1)			49 (6)		43 (8)	46 (11)	48 (13)	52 (17)	54 (14)	46 (5)	61 (3)		49
Grade VIII					53 (2)	52 (4)	59 (9)	58 (7)	57 (10)	56 (7)	58 (6)	58 (9)	66 (1)	57
Average	53	32	28	46	39	41	44	47	48	49	53	58	66	

NOTE.—Numbers in parentheses indicate number of cases.

TABLE 685

PHYSICAL AVERAGES IN HOMES OF DIFFERENT GRADES

Girls

Home Rating	40	41–45	46–50	51–55	56–60	61–65	66–70	71–75	76–80	81–85	86–90	91–95	96–100	Average
Grade V	59 (2)	35 (2)	36 (2)	47 (4)	40 (4)	30 (8)	44 (8)	50 (9)	44 (7)	46 (5)				43
Grade VI		35 (1)		46 (6)	55 (5)	43 (8)	46 (13)	43 (16)	45 (11)	54 (9)	49 (3)	56 (2)		46
Grade VII	56 (1)			48 (6)		40 (8)	44 (11)	50 (13)	52 (17)	53 (14)	43 (5)	52 (3)		49
Grade VIII					60 (2)	44 (4)	53 (9)	48 (7)	61 (10)	53 (7)	62 (6)	55 (9)	72 (1)	55
Average	58	35	36	47	50	38	47	47	51	52	52	55	72	

NOTE.—Numbers in parentheses indicate number of cases.

The correlations furnish no basis for a generalization as to whether mental or physical status is more closely related to home conditions. In the case of boys, the correlation with the home is higher for physical measures and in the case of girls it is higher for mental measures. These correlations are distinctly smaller than those with school grade (see Chapter VIII).

In order to show more of the detail of the relationship of mental and physical rating to home rating and school grade, four distribution tables are presented (Tables 682 to 685) giving for each sex the mental and the physical averages of those in homes of various levels, arranged by school grade. These tables give a somewhat more vivid impression of just what the correlations mean. While there is but a slight tendency for the averages in mental or in physical tests to show a relation to the home rating, there is a striking tendency for them to be positively related to school grade. In the case of mental tests, within each division of the table based upon home rating, the increase in mental average from one school grade to the next is present with but one exception in the girls' table and three in the boys'. In the case of physical tests the relation to school grade is less evident, though it is more striking than relation to home rating.

SUMMARY OF CHAPTER XIII

I. *Home conditions and school progress.*

Home conditions, as estimated on a numerical scale based upon a home visit, had an unexpectedly small relation either to remaining in school or to maintaining a normal school grade. The difference between working and school children from the same neighborhood on such a scale was only a few points in favor of the school children. The relation between school grade completed at fourteen and home rating among working children also showed comparatively small positive relationships. Within each school grade grouping, the distribution of home ratings was very wide.

II. *Various factors of home rating in relation to school progress.*

The factors considered in the home rating, arranged in order from those showing least to those showing most relationship to school grade completed were as follows: neighborhood, industrial status, family status, material conditions of the home, and parental attitude.

III. *Home conditions and physical rating.*

There was a small positive correlation between home rating and rank in tests of physical skill which amounted to .10 for the boys and .20 for the girls.

IV. *Home conditions and mental rating.*

> There was also a very small positive correlation between home rating and average in mental tests, which amounted to .03 for the boys and .27 for the girls.

The best known attempt to form a scale for the grading of homes is that of J. Harold Williams (1). Although it is published so much later, the present scale was devised before that of Mr. Williams and was already in use when his was published. The plan of the two is very similar. In both instances certain salient features of the home were selected for numerical grading and the points added to form a total. In the Williams Scale the final total is 25 points, and in this one 100 points. The larger number of points leaves room for expressing numerically finer gradations of judgment. In both instances, judgments are guided by a series of descriptive statements. No report of comparisons of groups of homes by the use of the Williams Scale is available.

Reference

(1) Williams, J. Harold—"A Guide to the Grading of Homes," Whittier State School Department of Research, 1918, *Bulletin No. 7*, Whittier, California.

CHAPTER XIV

SUMMARY AND INTERPRETATION OF FINDINGS

Limitations of the Data

Before attempting to summarize or interpret the facts presented in this study, it will be wise to review briefly the scope of the data.

We have five annual tests of mental and physical abilities for 753 children who were leaving school to go to work at fourteen years of age; 511 of these children were still available for examination at the end of four years when the fifth annual test was given. We have the same series of mental and physical tests for 760 children of fourteen who were intending to remain in school. Elimination was so rapid that by sixteen years only 322 of these remained for tests. Accordingly, 211 more children of sixteen who were intending to remain in school were examined. At the age of eighteen, 68 of the first set and 84 of the second set, making 152 in all, were still in school and were given the fifth test.

In addition to these laboratory measurements, we have for both series of children some very general facts about the social background, such as birthplace of parents, language of the home, employment of the mother outside of the home, and the number of rooms occupied by the family. Our home visits are complete for the working group only. A few visits to school children were made, but not a sufficient number to allow an analysis of the homes of school children as contrasted with those of working children. Industrial histories were kept for the working group only. If it had been possible to complete the home visits to all school children and to keep the industrial histories of school children as they were gradually eliminated from school and sent into industry, the data would unquestionably be of far more value than they are at present. The only reason that these additional investigations were not made was a lack of financial resources. The undertaking, even as it was carried out, was staggering in extent. In the face of rapidly increasing demands for practical applications of the laboratory procedure to immediate school problems and limited resources for research, it became impossible to complete the home visits and the industrial histories of the school group. The series is also incomplete in that no medical examinations of the children were made. A summary of actual physical defects would have added greatly to the interest of the series and helped in its interpretation at many points.

The analysis of the data presented in this study is obviously incomplete. Had our resources permitted, it would have been possible to work out many more correlations than those we have presented. No correlations dealing with the relation of individual tests to other tests or to social and industrial factors have been worked out. The number of interrelationships of this type which might be investigated from data of the degree of complexity of ours is almost infinite. It is perfectly possible to add later to this phase of the study other correlations which promise to be of interest.

The fact that only four years of industrial histories were kept and analyzed for the entire group constitutes a further limitation in value. If all the years of histories which might have been obtained had the funds held out had been studied, the findings would be far more valuable than they are now. It is possible that the present status of these workers can still be discovered and compared with their mental and physical ratings, though it is, of course, too late to obtain the details of employment from year to year.

The peculiar importance of the data consists of the fact that we have re-measured from year to year so large a number of the same individuals and that we have at least some social and industrial facts which can be correlated with the successive mental and physical measurements. In spite of the obvious limitations of this series, no other data as complete are in existence anywhere, or are likely to be collected for some time to come.

The Time Interval between the Experimental Work and Publication

The fact that the main body of data here reported was collected ten years ago needs some discussion. It was, of course, merely lack of financial resources for the enormous piece of statistical work represented that made us so slow in preparing the material for publication. More and more of the time of the office force had to be devoted to the practical demands of laboratory diagnosis, the issuance of employment certificates, and the placement of children in industry. What we must now consider is the extent to which time may have rendered invalid the interpretation of facts. In other words, is the situation which we are analyzing—namely, that of ten years ago—sufficiently comparable to that of the present to allow us to draw conclusions which still apply?

There have been some obvious changes due to the war. For instance, the entire level of wages has increased. The actual weekly and yearly earnings of children are considerably greater than they were at the time that we are discussing. The wages reported, therefore, would not apply to present conditions. There is no reason to think, however, that the relative wages paid to various groups would be any different to-day from what they were ten years ago. What we are interested in is not the actual amount of the weekly wage so much as the relation of weekly wages to educational factors and to the ability of individuals.

Changes in child labor laws have also modified certain factors within this period. When we began our investigation, children were leaving school to enter industry at the age of fourteen years and at any time after the completion of the fifth grade. Now, in the same state, no child is permitted to leave school under sixteen years and the standard requirement of schooling is the seventh grade. Part of this change in legal requirements was made during the period of the present study. In 1913 the age of leaving school was increased to fifteen years for boys and to sixteen years for girls. We had, at that time, a chance to observe the extent to which this change in age and schooling modified the industrial opportunities of the child. What we found was that the only modification in kind of work available consisted in the fact that a few machine jobs, such as power-machine operating, were open to girls at sixteen, which had not been open to beginners until the age level was raised. Wages were not modified at all for boys by the increase of a year in age. Raising the age level of girls two years increased the weekly wage about half a dollar a week.

There is very little reason to think that the opportunities which the business and industrial world offers to beginners will be radically modified by raising the age of beginning a year or two. Beginners are still beginners, and the types of jobs on which they are started remain the same. Indeed, they could not be changed, unless some readjustment in industry occurs by which other workers than beginners are used for certain operations, or unless certain occupations for which young children were formerly employed are provided for by other methods. A few such changes doubtless occur. Cash girls in stores have been replaced by automatic systems. To a slight extent, messenger boys have been replaced by disabled and elderly men. These changes are the only ones revealed by the yearly analysis of the type of work performed by beginners, which the employment-certificate office of Cincinnati makes each year. There is no reason to think that the slight diminution of errand work for boys and the fact that simple machine operating is now available for beginners would materially modify the analysis of the type of work performed by beginners or modify at all the relation of type of work performed to mental and physical ability.

The lapse of time must be kept in mind in considering the types of tests used. This piece of experimental work was begun before either the Stanford Revision or the Yerkes Bridges Point Scale was published. It was completed before the Army mental tests or any of the systems of group tests for school children were developed. Doubtless the choice of tests for a similar piece of work begun from five to ten years later would be different. Nevertheless, the tests used were sufficient in variety and in number to compare favorably with most of the modern systems. They have a much greater validity than group test results, since all of them were given individually under standard laboratory conditions.

THE VALIDITY OF MENTAL AND PHYSICAL TESTS AS MEASURES OF ABILITY

It is with great trepidation and a firm conviction that nothing final and entirely satisfactory can be said on the subject that the present writer enters into the discussion of the extent to which mental and physical tests of the type used in this study can be taken to indicate fundamental differences in ability between individuals. It is manifestly impossible for scientific methods at present to measure accurately how much of the efficiency of performance which mental and physical test ratings reveal is due to the native endowment of the individual and how much is due to the effect of environment upon him. None of us can question the importance of both factors. My own conviction is that mental and physical tests constitute a type of measure of the individual in which native endowment is a larger factor than in any other known standard of measurement. Tests have been used in the present study as indicating native capacity more definitely than educational and other environmental influences. What I wish to do now, in defense of this usage, is to quote the evidence from the present study which seems to justify it to a certain extent.

In the first place, the correlations of mental and physical ability from year to year have been high. Most of them, as we have seen, have fallen between the limits of .60 and .80. Furthermore, as our group approached maturity and the uneven processes of growth characteristic of adolescence were completed, the correlations increased in value. They are highest of all between year seventeen and year eighteen, in spite of the fact that the numbers represented at those ages are smaller than in any previous sets of correlations. It must, of course, be conceded that mere repetition of the tests from year to year may have been a factor in raising the correlation, but there is one point of contrast between the mental and the physical series which minimizes the importance of this possible effect of familiarity in in creasing the stability of performances. In the physical series the tests remained the same from year to year, whereas in the mental series they were changed from year to year. The tests of year seventeen and of year eighteen in the mental series differ from one another more than those of any two previous years. Nevertheless, the correlation is as high for mental as for physical tests, and is higher between seventeen and eighteen in mental tests than at any previous age level. It seems fair to conclude, therefore, that the high correlations of year seventeen to eighteen are due rather to the stability of approximate maturity than to practice effects or familiarity with the tests.

The second reason for feeling that the tests measure native ability to a greater extent than the effect of environment lies in the relation of the test results to school grade completed from year to year in the case of the working group. If the results of the mental tests were being strongly influenced by school training, then one might expect the correlations between mental-test records and school grade completed to grow somewhat less from year to year as school receded into the background and the very different environment of industry took its place. What we find is the reverse of this. The correlation of test records with school grades is somewhat greater among the working group at eighteen years after four years in industry than it was at fourteen years when the children were just leaving school and the effect of the school environment was still immediately present.

The third reason for feeling that the tests stress ability more than environment is the relationship which was found between the mental-test levels and the home-visiting records. The correlation between home level as measured by a home visit and the mental-test level of the child is surprisingly small. If environment were playing a large part in determining mental-test levels, then one would certainly expect home environment to be an important factor. The tables which analyze both mental-test measurement and the home measurement, with reference to school grade completed, (Tables 682 and 684) offer this further bit of testimony. Within each school-grade group a very wide variety of homes was found but the mental-test level of the children remained more constant. In other words, while the mental-test level bore a very direct relation to the amount of schooling which the child had completed, it bore a far less striking relation to the type of home from which the child came. It is inevitable, of course, that the ability of the child should be a large factor in the school grade which he has completed by a given age. However, if the chief factor concerned here were not the ability of the child but the effect of the school environment upon his test record, then one might expect differences of home environment to have an equally striking effect. The fact that they do not do so throws us back upon the theory that the correlation between school grade completed and mental-test record is due rather to the native ability of the child as revealed in mental tests than to the effect of schooling in fitting him to perform mental tests.

Our analysis of the cases which showed a marked discrepancy between the school grade completed at a given age and the mental-test level of a child again leads us to a belief in the fact that the tests reveal native capacity to a greater extent than the effect of environment. We found that in the case of a child of high mental-test level who had completed only the fifth grade, very definite health and social handicaps were present which seemed to explain the discrepancy. On the other hand, in the case of the small number of children of somewhat inferior ability who had completed the eighth grade at the normal time, we found favorable influences of home and social background.

While none of these considerations can be given the rank of scientific proof, they lead the present writer to believe that we are justified in accept-ing the results of adequate series of mental and physical tests as indicating native ability more definitely than environmental influences. Even if one does not grant this point I think few could question that the type and nature of the differences revealed by tests at the age of fourteen years must be taken as of permanent significance in the subsequent life of the individual. It is true that we are very lacking in investigations of the early stages of mental development. How much the environmental influences of the first few years of life may do to determine what we later call mental level, certainly no one, at present, can say. This fact does not debar us, however, from the conclusion that the level of ability reached by the age of fourteen years, and probably much earlier, is a thing which subsequent environmental influences can modify to a limited extent only. From that age on tests furnish a basis for very definite conclusions about some of the possibilities and limitations of the individual child.

The Differences between Working Children and School Children and the Interpretation of These Facts

Let me first briefly summarize the facts which have been brought out about the differences between our series of working and of school children. In the realm of physical tests we found the school child superior to the working child at every age from fourteen to eighteen. The differences, however, were considerably greater at fourteen than at eighteen. Roughly stated, at fourteen, one-fifth of the working group equaled or excelled the median of the school group, while at eighteen, one-fourth of the working boys and four-tenths of the working girls equaled or excelled the median of the school. This general statement, however, needs further analysis. Not all of the physical tests behaved in the same way in their relationship from year to year, nor did boys and girls present exactly the same picture. In height and weight school boys were very superior at fourteen years and much less superior at eighteen years, while school girls did not at any age differ radically from working girls in these measures. In steadiness, in mere rapidity, and in eye-hand coördination, the working children of both sexes gained from year to year upon the school group. In one test only, that of steadiness, did the working group eventually surpass the school group. This was true for both boys and girls. In strength and vital capacity, school children of both sexes became increasingly superior to working children so that by eighteen years the differences were greater in these two measures than they had been at fourteen years. Left-handedness proved to be greater among working than among school groups in both sexes.

The facts with regard to mental tests were somewhat simpler. School children proved to be superior to working children in every test made. Furthermore, the differences in mental test levels were much greater at eighteen years than they had been at fourteen years. In round numbers, at fourteen years, one-fourth of the working children equaled or excelled the median of the school children, and at eighteen years only one-tenth. It is interesting and significant that different tests show different quantitative relationships. The superiority of the school children was least in tests of mere memory or of routine processes such as cancellation and substitution. Tests of the construction-puzzle and mechanical-puzzle type held the middle ground. Tests which showed the greatest superiority of school children were those in which both logical thinking and a good command of language played an important part, such as association by opposites, mutilated text, and hard directions.

In addition to these differences in ability to perform mental and physical tests, the two groups differed in the age of maturity. The physical tests offered a far better basis for the determination of an approximate age of maturity than the mental tests, because in the physical series the same tests were used from year to year and direct comparison of one year's records with the next thus became possible. In the physical series it was very evident that school boys completed their years of rapid growth both in size and in skill earlier than working boys by from one to two years. The spurt of adolescent growth ended for school boys at sixteen and for working boys at seventeen. Since girls mature so much earlier than boys, our series does not show this type of difference so well for them as it does for the boys, though in measurements of skill the girls' records showed several instances of the earlier maturity of school girls. The few mental tests for which we have continuous records from year to year suggest that the same law holds in the realm of mental abilities. Though there is some indication that the school children finished their spurt of adolescent mental growth earlier than the working children, there is also proof that they continued to gain slowly from year to year longer than the working children.

Educational differences between our two groups of children exist in spite of the fact that we tried to eliminate them at the start. Our original intention was to select school children of the same educational attainment as our working children. Experience proved this to be an unobtainable goal because the working group contained so large a proportion of the retarded children that it could not be duplicated in children intending to remain in school. Accordingly, our school series has an advantage in containing more children from the two upper grades, the seventh and eighth, and fewer from the two lower grades, the fifth and sixth.

The few measures which made possible a comparison of working and school children on the basis of social and economic status showed a superiority of the school group in this realm also. School children had fewer foreign-born parents than working children. They had fewer mothers who worked outside of the home. Their families occupied a somewhat greater number of rooms per family. The visits to homes of school children, which were in the same neighborhoods as those of the working series, showed also a slight superiority to the homes of working children.

Granting the reliability of these facts, what do they mean? When we first began the present study our chief interest was that of attempting to determine the effect of industrial life upon children who left school and entered industry as early as the law permitted. Now that our study is complete, we find that very few of the facts obtained offer any possibility of unequivocal statements on this point. The great superiority, both physically and mentally, of school children over working children might be taken as proof of the bad effects of industry upon working children, were it not for the fact that the differences are present in marked form at fourteen years, before any of the children have actually entered industry. In our fourteen-year series the only difference between the two groups was that the working children had expressed an intention to leave school and go to work, whereas the school children were expressing an intention to remain in school. Obviously differences existent at this point must be due to the selective effect of whatever factors are determining early elimination from school. They have nothing to do with industrial life as such. The first point, therefore, that we must seek to understand in interpreting our data is why some children leave school at fourteen years of age whereas others remain in school for much longer periods. Let me, then, attempt to state what, in the light of this study, seem to be in order of importance the factors determining whether a child shall be eliminated from school as early as the law permits, or whether he shall remain to the completion of whatever educational opportunities are offered. They are (1) level of ability of the child; (2) parental attitude and family ideals; (3) health; and (4) industrial status.

(1) The factor which stands out as of greatest importance in determining the period of leaving school is, I believe, that of the level of ability of the child. Let me state briefly the points in this study which seem to support this thesis. The most important one is that of the very great contrast in test level and in school progress between the children who leave school at fourteen to go to work and those who are intending to remain in school. Retardation and an inferior grade of school work bring about a sense of failure and inferiority, a conviction that the school is not for them, and a consequent desire to try new fields which lead directly to school leaving. Differences in home conditions between the two groups have been shown to be less striking and less constant than differences in ability as revealed by tests. It is obvious, however, that inferior ability is not the only factor involved in elimination from school. Some very superior children are eliminated early; furthermore, after the age of sixteen, those who leave school are not definitely inferior to those remaining in school.

(2) The second factor in order of importance is that of parental attitude

toward the child and his education, and of family ideals. The entire matter of home atmosphere and whether it tends to promote the normal mental life of the child and to stimulate in him an appreciation of education and a desire to obtain it, is of vital importance. A family atmosphere which is torn by dissentions between the parents, or a broken home caused by separation of the parents, creates in the child a state of mental distraction and eventually a discouragement which prevents the school progress of which he might otherwise be capable. In other instances, although the family atmosphere is normally harmonious, the parental ideals of education may be very limited. The child is brought up with the ideal of immediate wage-earning rather than with that of remaining in school. Both the religion of the family and the country from which the parents come, if they are foreign-born, affect educational ideals. The superior children who leave school early are apt to come from families in which the parents are foreign-born or from Catholic families.

(3) The point which ranks third in order of importance is that of the health of the child. Obviously, poor health alone may make it impossible for a child to profit by his school opportunities even if other factors are favorable. Instances determined primarily by health, however, are much more rare than those determined by family atmosphere.

(4) Last of all in importance I should rank the economic status of the family. It seems to be true that if the ability of the child is adequate and the parental ideals are fixed upon education, some way is found to keep the child in school. Among the children who remained in school are instances of heroic sacrifices on the part of the family to keep them there. Some mothers displayed an ability in managing small financial resources that was nothing short of genius, and that made it possible for children to remain in school in the face of apparent impossibility. There were, however, cases where plain inability to meet the cost of education was the chief determining factor in elimination, though they were rare.

In support of my point that the economic status of the family is of much less importance in determining school career than the mental level of the child, let me refer once more to the contrast between our school children who were tested at the fourteen-year level and those who were tested at the sixteen-year level. If economic status were the more important factor in keeping children in school, then we should expect the economic factors of the fourteen-year school group and those of the sixteen-year school group to be similar. As a matter of fact, they were very different. In economic status the fourteen-year school group was midway between the working group and the sixteen-year school group. It was in mental-test level that the two school groups were closely comparable. In the case of the boys, the fourteen-year group contained even more very superior members than the sixteen-year group. In other words, while the economic level of these two groups of school children differed radically, the mental level was about the same, indicating that mental level had far more to do with remaining in school than economic level.

Our conclusion from this analysis must be that the inferiority of working children is due to a very natural tendency for the inferior to leave school early. As we have seen, some of the superior leave early, too. However, the point to keep in mind in interpreting the relationship of mental and physical tests in the two groups is that working children, as a group, are inferior to school children from the beginning of their industrial career and because of a process of natural selection which brings it about that inferior children are eliminated early from school.

As we have seen, the working children improve more rapidly than the school children in physical abilities during the years from fourteen to eighteen, although they never become the equals of the school group. The explanation of the somewhat more rapid physical progress of the working children is to be sought chiefly in the fact that the inferior individual advances more slowly and has his years of rapid growth later than the superior one (see Chapter VI). School children are nearer their physical maturity than working children at the ages of fourteen and fifteen. After fifteen they gain proportionately less than working children. On the other hand, working children have their years of rapid growth later and make more rapid physical progress after fifteen than school children. They tend to gain upon school children between fifteen and eighteen. So far, then, we seem to be dealing with the laws of growth as they apply to superior and inferior individuals rather than any specific effect of either school or industry upon the children.

Let me now attempt to make a more detailed interpretation of the separate tests of the mental and physical series in their relationship to the two groups from year to year, to see whether differences in the effect of working and school environment are suggested.

There are two tests in which school children became even more superior to working children at eighteen than they were at fourteen. They are strength of the hand and vital capacity. These are the two tests which seem obviously related to size. Nevertheless, while differences in size between working and school boys decrease, differences in strength and vital capacity increase. Among girls the two series do not differ at any age in size, but the progressive difference in strength and in vital capacity from fourteen to eighteen takes place. Strength and vital capacity may be related to general vigor and available energy rather than to any specific factors of training. The only aspect of school life which could be important in direct training of these capacities is that of athletics or physical training, and it seems doubtful whether there is enough drill of this type in high school to account for the result. The more probable interpretation is that school life favors general physical vigor and energy more than working life.

On the other hand, in mere rapidity and in rapidity of eye-hand coördination, the working group gains more rapidly than the school group. These tests represent more definitely specialized skills than either strength or vital capacity. Most kinds of factory work call upon either mere rapidity or rapidity of coördination. The working group had the greatest advantage of all in steadiness. In this capacity alone they excel school children at the age of eighteen. Steadiness is not obviously related to most of the kinds of factory work open to beginners. We are apt to think of it as dependent upon either a high degree of nervous control or a low degree of nervous irritability. There is one sense in which working children may have a greater degree of nervous control than school children. One colleague who has had a wide experience in the handling of both school girls and working girls tells me that working girls display more stability in the execution of any practical task than school girls. She believes that the discipline of a life of wage-earning gives them more power to carry out the task at hand, no matter what their temporary feelings and impulses may be, than school girls possess. In this sense she believes they may be said to have more self-control than school girls. There might be reason to believe that working children are as a class more phlegmatic than school children. School life is more varied and probably has greater elements of stimulation than working life. School children may be living at a higher degree of nervous tension than working children. Certainly it was easier to arouse interest and call forth effort on the part of school children than on the part of working children.

Let me now turn to the more detailed consideration of the course of the mental tests from year to year. In this realm the school series has the advantage in every test and it is an increasing one from year to year up to eighteen years. The superiority of the school children at fourteen is undoubtedly, as in the case of the physical tests, related to the selection of the superior individual to remain in school. What we must now attempt to explain is the progressive increase in the differences between the two groups. It is obvious that several factors may be and probably are concerned. In the first place, as we have seen, it is the inferior who are eliminated from school from year to year. The progressive elimination of the inferior from the school group would of itself tend to raise the level of those remaining as contrasted with working children. However, our study of the omissions from the school series (see Chapter V) has shown us that, from sixteen on, those eliminated are of the same level of ability as those remaining. Since it is from sixteen on that the greatest difference between working and school children obtains, elimination is not a sufficient explanation. The second point to consider is the obvious one that advanced school training has an effect on certain types of ability which are called upon by the tests. The tests in which a large vocabulary and a skillful use and interpretation of language are involved are obviously related to school training. The differences between school and working children are greatest, as a matter of fact, in tests involving the kind of thinking which is expressed in language, such as hard opposites, mutilated text, and the hard directions. However, the group of tests which stand in the middle of the series with reference to the contrast between school and working children is that which is most unrelated to ordinary school work, such as the construction puzzles, recognition, and the mechanical puzzles. The great superiority of the school children in this type of performance is not obviously related to any specific effects of school training. The tests which show least contrast between school and working children—those of memory, cancellation, and substitution—have a far more obvious relationship to school drill than the group we have just been discussing. Evidently, then, school drill is not accountable for all of the progressive differences between working children and school children. We must, I believe, fall back upon a third factor as evidently involved in producing the result—that of the longer period of mental development which is characteristic of superior children (see Chapter VI). In spite of the fact that the superior children have their years of rapid mental development earlier than the inferior, they seem to continue growing longer than the inferior.

Our summary is as follows: School children are better mental stuff at fourteen years than working children. Up to sixteen years the school group is further improved by the elimination of its inferior members. After sixteen superior children keep on making mental progress longer than the inferior. Furthermore, our school group has the direct advantage which educational training gives in certain types of tests. The combined action of these three factors gives them their great advantage at the ages of seventeen and eighteen.

Sex Differences and Their Interpretation

In the series of physical tests and measurements boys proved to be very superior to girls in every test except that of card-sorting. It seems to be true in general that girls are somewhat superior in all of the processes of eye-hand coördination, such as card-sorting, cancellation, and the copying parts of the substitution test. They are also somewhat superior in memory and in tests of logical association expressed in language, such as association by opposites, cause and effect, mutilated text, and hard direction. On the other hand, girls are inferior in the recognition tests and are very inferior in all types of construction puzzles and mechanical-ingenuity tests. It seems to be true, then, that boys have a very real advantage in keenness of observation and ability to do the kind of thinking which involves observation and manipulation of objects. Girls have a much smaller advantage in memorizing, rapidity of coördination, and the kind of thinking that involves the interpretation and the use of language. These results confirm a large mass of data previously obtained. Our series shows no clear difference in variability between the two sexes.

It seems to be true that boys who remain in school are more highly selected on the basis of ability than girls. The evidence for this is found in the fact that school boys are more superior to working boys than school girls are to working girls. This is true for both physical tests and mental tests. One more piece of evidence which points to the same fact is that boys of the fourteen-year school group who came from districts where going to work is the rule proved to be particularly highly selected on the basis of ability. They were the equals of the boys of the sixteen-year school group who came from neighborhoods where staying in school is the rule. The girls of the fourteen-year school group were inferior to those of the sixteen-year school group. Interpreting this fact is by no means easy. It is well known that the number of girls who complete high school is greater than the number of boys. In other words, education for girls is a more general custom than education for boys. The family seems more inclined to take it for granted that boys will go to work early and is, perhaps, more reluctant to have girls go to work. Since this is the case, it is probably the very superior boys, those who have a genuine interest in education and a desire to obtain it, who stay in school in spite of the somewhat common assumption that they will leave.

Our series contains some proof that girls reflect the conditions of the home more clearly than boys. The correlation of tests of ability, both physical and mental with home estimates, was materially higher for girls than for boys. It was also true that there was a more definite positive relationship between home conditions and school grade completed in the case of girls than in the case of boys.

The sexes differ in rate of physical maturity. Girls mature much earlier than boys. The fact that they mature earlier in point of physical growth has long been known. Our series contributes to this the fact that they mature somewhat earlier in matters of physical skill, such as rapidity of motion, steadiness, and eye-hand coördination. In the realm of mental tests there seems to be no sex difference in the rate of maturity. The present series is, of course, not adequate to establish this point conclusively; we can only say that so far as these tests go no sex difference in rate of maturity in mental tests appears.

The industrial histories of boys and girls show very interesting differences. Girls are at a very decided disadvantage during the first four years. The wages paid them from the start are materially less than those paid to boys of the same age and advancement. Girls have slightly more unemployment than boys. They are somewhat steadier workers in the sense that they change positions less frequently. The number of industries open to them and the number of different kinds of work which they perform are enormously less than in the case of boys. Furthermore, while physical ability, and to a much less extent mental ability, gives a boy slight advantage in wage-earning, it is a disadvantage to a girl. Girls who are very inferior in mental and physical equipment have a slight advantage in earning capacity and in opportunities to obtain work over superior girls.

None of these sex differences in industrial success are contingent upon the mental and physical differences inherent in sex; they are due entirely to custom and social viewpoint. Girls are less welcome than boys in industry, partly because social custom demands that they be treated with greater consideration, and partly because they are regarded as less permanent workers. The expectation is that for them employment is a temporary expedient until marriage occurs. The fact that during the first few years in industry they prove to be more permanent on their jobs than boys in no way modifies this attitude.

The lower wages are a secondary result of the fact that girls are not really desired in industry if boys can be found to do the work. Doubtless the fact that girls are more carefully protected by the home and have had less experience in going about and in fighting for their rights than boys has something to do with the situation. Few of them have the courage to stand out for better wages or better working conditions. Furthermore, they are unwilling to take positions which rank low socially. Office work, no matter how routine, or sales work, make the greatest appeal to these poorly trained beginners. Competition for this type of position is intense among them and wages can be kept low. The department store and the office, like all other employers, pay only what they have to to get their help. They find it possible to obtain the superior girl at a wage even lower than that paid to inferior girls to do the routine work of the factories.

Industrial Histories and Their Relation to Other Factors

A. *Review of facts about industrial histories.*

A brief statistical summary of the outstanding facts about the industrial histories, for the first four years, of boys and girls who left the schools of Cincinnati to go to work at the age of fourteen in the year 1911–1912, is given in Table 686.

The table brings out the following facts of general interest. Earning capacity of beginners in industry more than doubled during the first four years of work. This is true in terms of total yearly earnings and of average weekly wage. It holds for both boys and girls. The median wage of boys between seventeen and eighteen years, in their fourth year of employment, in the year 1914–15, was $408, and for girls $334. The best estimate of the average annual earnings of industrial workers in the same years is that presented by Mr. Frederick R. Macauley in *Income in the United States.* He states the average annual earnings of all employees in industries in 1914 as $674 and in 1915 as $697. In factories, the average annual earnings were $616 in 1914 and $653 in 1915. These estimates included not only wage-earners, but managers and executives. They would be a trifle less for wage-earning alone. Since our records began in March, rather more of our wage data apply to 1914 than to 1915. If we take the 1914 figure as a basis of comparison our conclusion is that seventeen-year-old boys were earning about two-thirds as much as the average adult, and seventeen-year-old girls a little more than half as much.

Both boys and girls proved to be fairly steady workers. Even in the first year, from 65 to 70 per cent of them had not more than two weeks of idleness. By the third year the proportion was 81 and 82 per cent. The average number of positions held during the year was less than two after the first year, and only 2.2 for boys and 2.0 for girls during the first year. This is a far steadier group of workers than we had been led to expect. The number

TABLE 686 — SUMMARY OF FACTS ABOUT INDUSTRIAL LIFE

	Year 14–15	Year 15–16	Year 16–17	Year 17–18
Median yearly earnings				
Boys	$186.00	$259.00	$345.00	$408.00
Girls	150.00	216.00	285.00	334.00
Median weekly wages when employed				
Boys	3.83	5.20	7.11	8.33
Girls	3.10	4.41	5.97	6.66
Per cent employed 50 weeks or more				
Boys	68.8	73.7	81.1	77.1
Girls	65.1	70.7	82.1	86.0
Average number of positions held				
Boys	2.2	1.9	1.7	1.5
Girls	2.0	1.6	1.4	1.3
No. of kinds of work done				
Boys	31	39	40	38
Girls	16	16	14	14
No. of kinds of industry entered				
Boys	108	122	134	145
Girls	46	54	69	57

of kinds of work done by boys and girls remained fairly constant. It was from 31 to 40 for boys and from 14 to 16 for girls. The number of kinds of industry in which the children worked increased from year to year. Boys worked in 108 different industries during the first year, and in 145 during the fourth, while girls worked in 46 the first year, in 69 the third, but in only 57 the fourth year.

B. *Relation of industrial histories to school grade completed at fourteen years.*

Wages bore no relation to school grade completed during the first four years in industry. This remained true whether wages were measured by total yearly earnings or by average weekly wages for the time employed. The statement holds for both sexes. There was very little relation between school grade completed and unemployment during the year. Fifth-grade boys and girls had more time unemployed than upper-grade children. In terms of the number of positions held during the year, there was a consistent relationship to school grade for both boys and girls. The higher the grade completed, the fewer the positions held in the course of a year. The kind of work done also showed a relationship to school grade completed. Factory work was far more predominant among the lower- than among the upper-grade children, while office and sales work had a much larger representation among the upper- than among the lower-grade children. Upper-grade children evidently had a wider opportunity for choice of work than lower-grade children. The eighth-grade group showed the widest distribution through the various kinds of industries of any, though it was numerically the smallest grade.

C. *Relation of industrial histories to level of physical and mental abilities.*

The striking fact is that there was so little relationship of any sort between ability as measured by the tests and industrial factors. Superiority in physical skill in the case of boys was a real factor in wage-earning capacity. All of the other correlations were so near zero as to indicate little relationship of any sort. On the whole, what correlation there was with the industrial factors was slightly positive for the boys and slightly negative for the girls. In other words, there was a slight advantage in wage-earning and in regularity of employment for superior boys and for inferior girls.

The explanation lies in the kind of work done. The inferior boys were employed chiefly in factory work, whereas the superior boys were, in much larger proportion, employed in office work, sales work, or the more skilled trades. The wages paid, however, were almost as good for the factory work as they were for the grades of office or sales work open to these boys. In the case of girls, the wages paid for the inferior types of factory work were somewhat higher than those of office or sales work. The explanation is doubtless to be found in the attitude of the children toward their work.

Most of them prefer office or sales work to factory work. There is, therefore, a great deal of competition for positions in offices and stores. The superior children naturally succeed best in the limited number of such positions open to beginners. Consequently we found the superior monopolizing most of the office and sales work. The employer, however, found it unnecessary to pay them any more than he did the inferior children to do the less desirable kinds of work. This holds true throughout the first four years in industry. The comparative equality in industrial factors of inferior with superior children was even more evident in the fourth year than it was in the first year. It would be exceedingly interesting to know whether this relationship was maintained from year to year beyond the point of the present study. It may be possible in the future to trace the same group of children and find out how they stand after a lapse of ten or fifteen years instead of four years. Meanwhile there are some general considerations which lend color to the view that the small part played by mental ability in wage earning is a very general phenomenon in society.

The Russell Sage Foundation in a comparative study of the wages of teachers and laborers found that, over a period of about one hundred years, city teachers were paid somewhat less than skilled artisans, and country teachers somewhat less than day laborers. No one can question the fact that teachers as a class are more able mentally than laborers. Furthermore, the mental tests of the Army showed that members of the learned professions—namely, ministers, engineers, and doctors—rank above other occupational groups in the community. It is sufficiently obvious, however, that ministers, engineers, and doctors are not the highest-paid members of the community. The ministry, whose mental-test level seems to be particularly high, is one of the most poorly paid occupations.

In campaigns for keeping children in school and in the literature of educational propaganda, many statements have been made about the value of education in terms of wage-earning. Various sets of statistics have been presented showing the advantage in wage-earning capacity of children who leave school at eighteen over those who leave at fourteen. According to the results of our present study, these differences, in so far as they are real and are not based upon unrecognized factors of selection in the groups studied, would have to be interpreted as due to differences in education rather than differences in mental level. In our series the children who left school at fourteen whose mental capacity was just as good as those who completed high school were earning at eighteen only the average amount for the group which began work at fourteen. We seem entirely justified, therefore, in stressing the importance of education in bringing about these differences in wage-earning. On the other hand, there are many considerations which point to the fact that there is no very close or consistent relationship either between ability and wage-earning or between degree of education and wage-earning. In our own series a difference in educational attainment of three school grades made no difference in earning capacity during the first four years. It is doubtless true that most members of society who have a large earning capacity either in business or in professions are superior people. Their number, however, is not sufficient to affect the course of general correlations very much. When we consider that in the year 1914 only 5 per cent had incomes as high as $2000 a year and less than 1 per cent incomes as high as $8000, the fallacy of trying to draw conclusions which would be applicable to the 99 per cent from the facts about the 1 per cent is evident (see *Incomes in the United States*—National Bureau of Economic Research).

To go on stressing the money values of education in the face of evidence to show how slight it is, is certainly not wise policy. In educational propaganda, as elsewhere, honesty is the best policy. Nor is the fact that wage-earning is so little modified either by ability or by education altogether without its consolations for the idealist in education. To present education as of value, not primarily because it contributes to wage-earning, but because it opens the way to work which may offer a rich reward in the pleasure of performance and at the same time make a contribution of higher value to community life, is a type of educational propaganda to which the idealist may subscribe with enthusiasm. Fortunately it is the kind of work, rather than its financial rewards alone, which, as a matter of fact, now determines the industrial choices of children. The girls of superior ability and educational attainment might have entered the factories at the highest wage paid beginners and advanced rapidly to still better paid factory work. Instead they chose to enter department stores and offices at a lower wage and put up with a slower rate of advancement in wages. We are not for the moment concerned with the question as to whether this was a wise or an unwise choice, but merely with the fact that it was the attractiveness of the kind of work to the child and its social values to him which determined his choice, rather than the amount of money he could earn. It is very possible that a change in interests and ideals which would lead children to a better understanding of the process of factory production and of its importance in fulfilling the common wants of mankind, might increase its attractiveness and lead better types of children to choose it. Our present point is—once more—that if factory work becomes more attractive to young workers it will be not because of its superior wages but because of a change in the child's ideals of work and its place in the world.

No one, least of all the idealist in education, questions the fact that wage-earning—at least to the extent of securing an adequate living wage—is a first essential of living. Beyond this point, however, what justification is there for our assumption that superior ability and the superior education which it connotes should be recognized by society in terms of wage-earning? Granted that a man is not responsible for his native endowment and that he makes the most of it, first in terms of education and then in terms of work in the world, what justice is there in expecting that his financial rewards should be proportionate to his ability and the type of work he performs? The leveling process of our present system, according to which for most people rewards must be found in the work itself and in the worker's sense of its value rather than in wages, has some elements of a rude social justice about it. At least to hold forth to the young ideals of intrinsic interest in work and of social service as motives for endeavor, rather than the mere prospect of money advantage, constitutes a higher type of educational and social ideal.

Our practical difficulty in applying this attitude toward preparation for work to the entire group of children presents itself in the fact that so large a proportion of children of inferior endowment are sure to earn a living in kinds of work which offer so little in terms of intrinsic interest or in pleasure of performance. How to arouse enthusiasm in the young for routine factory work is a well-nigh insoluble problem. Nevertheless, since routine factory work it must be for many, the task of the educator becomes that of giving the child as wholesome and as hopeful an attitude toward it as possible. Just what can be done to solve the problem of the inferior child, first in education and later in the occupational world, will be discussed more fully in connection with the problems of vocational training and vocational guidance.

APPLICATION OF THE FINDINGS OF THE STUDY TO EDUCATIONAL POLICIES

A. *Age of leaving school.*

The question of what is the correct upper limit for compulsory education is one which has given much concern to educators and to those interested in preventing harmful child labor. Much of the discussion has hinged upon the question of what the schools have to offer adolescent children and what industry has to offer them. Educators and social workers have very generally arrived at an agreement that fourteen years is a minimum age for leaving school. At present the tendency is to advance compulsory education to sixteen years. In the light of the present study I should like to discuss the matter from the standpoint of the rate of mental and physical development of adolescent children. So little has been known scientifically in this realm, except in terms of physical growth, that such considerations have not played as large a part as they might in guiding policies.

It seems sufficiently evident that the years of very rapid growth, physical and mental, should be spent in school rather than in industry. This study has shown that, on the whole, school furnishes a better background for physical development than industry in that school children are always ahead of working children. It is even more evident that school furnishes a better background for mental development. The period of rapid mental growth should be one in which the acquisition of knowledge and of fundamental skills is the chief concern of the child. This study has shown that the years of rapid development are not the same for the two sexes and not the same for superior and inferior individuals.

If sex were to be made the basis of difference in the age of leaving school, as has been done in some states (see Ohio law, 1913), there would be more reason for allowing girls to leave school early than boys. They reach their physical maturity a year or two earlier. However, it is probably not true that they reach mental maturity earlier, and doubtless considerations of mental development are the ones which should be given greatest importance in determining the age of leaving school. There is no scientific justification whatever for a procedure such as that of the Ohio law of 1913 which allows boys to leave school at fifteen while it keeps girls in school until sixteen. Considerations of mere expediency determined this policy. The demand for boys in industry was so great that the legislature would have refused to pass a law which kept them in school until sixteen. There was far less objection to keeping girls in school until sixteen because the demand for them in industry was small.

If a difference in the age of school leaving were to be made on the basis of rate of development, then superior children would have to be allowed to leave school earlier than inferior ones. They complete their years of rapid approach to maturity a year or two earlier. This difference is clearly established in terms of physical growth and of physical skills, but is less certain in terms of mental maturity. However, it would be absurd to pass laws allowing superior children to leave school early, since they are the ones that, as a matter of fact, stay in school longest because they can profit most by school training. In the interests of public policy the superior should be kept in school as long as possible because they have the greatest possibilities for making contributions to community life. Since it is, as we have seen, chiefly the inferior children who drop out of school as early as the law permits, the age of school leaving should be determined by the period at which the inferior group completes the years of rapid mental and physical growth. Sixteen years is the age which seems justified on this ground. By that age girls have unquestionably completed their years of rapid development. The year between sixteen and seventeen is important in the development of some of the boys. If the age is to be uniform for the two sexes, sixteen constitutes the best compromise. If a sex difference were made, sixteen for girls and seventeen for boys are the ages indicated.

The objection to the sixteen-year age limit for leaving school has come in part from the school itself and its based upon the fact that inferior children cannot keep up the academic pace of the traditional school until the age of sixteen. They merely become retarded and discouraged, develop a sense of inferiority, form bad habits of truancy, and sometimes become delinquent. This is all quite true, but the solution of the problem should be that of changing the type of school to fit the child rather than that of eliminating the child from school. Surely some legitimate content of education can be found to keep these inferior children profitably and happily employed during their years of most rapid mental and physical acquisition. In the discussion of vocational training and vocational guidance we will take up more in detail the question of what the content of education might be for this group.

The worthlessness of the work open to children under sixteen has often been stressed as a reason for keeping them in school. We have seen in this study that the positions open at sixteen are almost as worthless, considered as opportunities for development, as those open at fourteen. Their only advantage is that they may be of a more permanent type. Children under sixteen cannot be employed on machines. We have seen that most of our inferior group earn their livings at machine-tending. It may be argued that it is better to keep children in school until they can start at a kind of work which at least may be a permanent method of earning a living.

B. *Scholarships for superior children.*

This study has shown clearly the tendency for superior children to remain in school. The policy of keeping them in school is obviously a wise one. Scholarships for this purpose have been advocated by many and are actually in force in some of our large cities, notably New York, Chicago, and Cincinnati.

Some educators have objected to scholarships, or rather have been loath to take up the task of providing them, because they thought the number of applicants would be so great that the task would become superhuman. Knowing the very large proportion of children eliminated as early as the law permits and believing that most of them should be kept in school, they have considered the task of scholarships hopeless.

This study has shown, first, that on the ground of ability not more than one-fourth of those who leave school as early as the law permits could be considered possible candidates for scholarships. It has shown further that of this fourth, many have belonged in families in which the conditions were unfavorable to a continued school career. Either the family atmosphere was so bad as to distract the child from an interest in school or the ideals of the family were definitely in favor of early withdrawal from school. We found in Cincinnati that some of the most superior children in the working group could not be lured with scholarships even to consider remaining in school. Their minds were entirely made up to leave and family ideals were all against remaining. The number of children who have the ability to profit by education beyond sixteen years, who have the desire to continue, and who need financial aid to help them do so, is comparatively small. In the judgment of the writer on the basis of the present study and of four years of experience in administering scholarships, the number of legitimate candidates for scholarships above sixteen years is less than 5 per cent of the entire number who leave school at any age. In Cincinnati, a sum of less than $10,000.00 was sufficient to grant all the legitimate applications. Doubtless a change in educational ideals may increase the number. It is to be devoutly hoped that it will. But however small the number is, it is exceedingly important that these few should be provided for by scholarships. We have faith that superior ability, if trained, can render service to society of a superior order.

The terrific disadvantage under which children of superior mental ability without education labor has been made clear in this study. They can secure for themselves no advantage in terms of wage-earning. Their advantage in terms of type of work performed consists only in the choice of inferior grades of office work or minor sales positions instead of machine-tending in the factories. When we consider the fact that some of these children would be capable of making a real contribution to the industrial, the social, the educational, or the æsthetic life of the community, it seems an obvious point of good social policy to give them whatever added advantage education can supply.

C. *Provision for individual diagnosis in the school system.*

If the school is to fulfil its ideal function of providing each child with as much education as he can profitably take and with the kind of education suited to his capacities, then provision for mental and physical diagnosis of children must be made in the school. It is generally recognized that medical service for the discovery of physical defects which are interfering with school progress is a legitimate part of school procedure. It is less generally conceded that provision for adequate mental diagnosis and the discovery of mental difficulties which may be interfering with school progress is equally necessary. If it is true that levels of ability differ widely, it must follow that education needs to be adapted to level of ability.

Probably few would question this general assertion. The doubt enters in when we ask ourselves whether we have any way of diagnosing the level of ability accurately. No one questions the difficulty of the task or the chance of error in the individual case. Nevertheless, recent educational experiments as well as the data presented in this study and in a host of others show that the proper use of mental tests aids greatly in forming a correct judgment of the level of ability of the child. What needs to be emphasized is that a mere mental-test result is not sufficient. The factors of health, of the home background of the child, and of educational history up to the time when the test is made must all be taken into consideration.

There can be no real doubt, however, that a psychological laboratory in the hands of a properly qualified expert can enable a school system to make a far better classification of its children with reference to their ability to progress in school than can be done without it. In judging the value of the psychological laboratory in leading to a correct estimate of individual differences, one needs to compare the school of the present with that of fifteen or twenty years ago in its ability to understand and treat wisely varying types of children. Again scientific proofs are not available. One is reduced to stating a profound conviction that the school of to-day is far better able to recognize individual differences and to take them into account in educational treatment than the school of a decade or two ago. That mental tests have been the greatest single factor in bringing about the improvement is obvious. That the system of mental testing is open to abuses there can be no doubt. Too often the mere result of a mental test—even of a group mental test—has been given undue weight in the judgment of the child. To interpret a test result in the light of other findings requires trained judgment and experience. The fact that mental tests may be abused and their results misinterpreted constitutes no more reason for opposing them than the same reason would lead us to do away with medical drugs or courts of justice. Our efforts should be centered on securing a wise use of the tests by insisting upon adequate training and preparation on the part of those who use them, and by improving the technique of the tests themselves and increasing our knowledge of the interrelationship of mental test level with other factors of personality.

In addition to the psychological laboratory the school needs a means of making social diagnoses, such as are contributed by the modern visiting teacher. Next to the mental level of the child, home atmosphere and ideals have been shown to be the most potent factors in determining school progress. The modern educator must regard all of the factors that further or retard the progress of children in school as relevant to his task. In so far as it is possible, the school must feel responsible not only for diagnosing mental and physical traits in the child but also for understanding his social background and for doing what can be done to better it.

At present the school is very lacking in a technique for relating its problems to the home. Theoretically the school is an adjunct to the home, created for the purpose of assisting parents in their task of bringing up children, and yet only too often the education of the home and that of the school are conducted quite independently of one another. Something of the technique of social case work, as developed by the social worker, must be taken over by the school in its investigation of the extra-school-room conditions which are interfering with school progress. The visiting teacher is the pioneer who is blazing the trail in method, but her lead must draw after it a host of followers before the general need is met.

As far as machinery is concerned, the attendance department of the school holds the strategic position. The difficulty with our present attendance officers is that they have the traditions of the police officer rather than those of the social worker. Their function has been in the past merely to arrest and haul into school truant children. The attendance officer of the future should have the function now being performed by the visiting teacher: that of diagnosing the conditions of home and neighborhood which are interfering with school progress and of doing what can be done to correct such conditions. To fulfil these functions more officers would be required, and the standards of training and preparation would have to be made more rigid and different in kind. When the attendance departments of the schools are transformed into departments of social diagnosis and treatment, the school will be equipped to deal with a phase of education which is at present sadly neglected.

One must of course concede that what the school can do to better home conditions and raise the level of home ideals is limited, but no other agency in the community has the same opportunity to come in contact with all the homes of the community in an educational capacity. The visiting teacher has amply demonstrated how such a function assumed by the school may result in better educational progress for the child. Probably no addition which could be made to our school organization would bring larger returns than that of a department of social diagnosis and treatment. We may look forward to it as one of the next great developments of public school education. Not until the means of social diagnosis are at hand can the psychological laboratory of the school function adequately.

D. *School responsibility about home conditions and the education of parents.*

In the previous section we have pointed out that it is incumbent upon the school to become interested in the conditions of the home and in home atmosphere and ideals in so far as they determine school progress. Every social worker knows how difficult it is to make over a home which is already established with its adult personalities who fix the tone and who are so difficult to modify. As in every phase of social endeavor the greatest hope lies in prevention. Not the attempt to remodel the homes which now exist, but the effort to better the homes of the future by bringing up a more adequate set of parents, constitutes the most constructive program. Doubtless every real improvement in the educational system means the production of better types of individual citizens and therefore of better homes for future generations of children.

However, up to this time our educational system has been negligent of its task in not providing specific training in the preparation of young people for homemaking and parenthood. Most boys complete their entire quota of education, whether it ends with the elementary school or with the college, without any reference to the fact that they will become heads of families and fathers and that some knowledge about children and their bringing up is necessary. Girls are now given preparation for homemaking in terms of the techniques of cooking, sewing, budget-making, and interior decoration. Most of them, however, finish their formal preparation for living without any specific instruction about the care and management of children. But the care and management of children in the home is not a matter which can be safely left to untrained instinct. The vast number of children who become behavior problems for the schools and the social agencies show the extent to which homes are failing badly in equipping children for the simplest and most obvious social adjustments.

To be sure, not all of the social failures of children can be charged up to the home. Bad school adjustment and unintelligent school management are also factors, though much smaller ones. Most of us who have been engaged for years in diagnosing the sources of delinquency in childhood, as they appear in the school office or the juvenile court, are agreed that most juvenile delinquency is directly traceable to inadequate homes and poor home training and management. As one psychologist of a juvenile court recently expressed it, "Most delinquency in children is directly traceable to delinquency in parents." Furthermore, it is the experiences of early years, before the school comes into contact with the child, which produces the most profound impression on character and personality. Even when the inadequate home does not result in delinquency, it is sure to result in an inferior type of educational and social adjustment. We have seen in the present study how a bad home atmosphere may so handicap a child of more than average mental ability that he becomes three years retarded in school by the age of fourteen years and fails to adjust successfully to industrial life after he leaves school.

The task of preparing young people to be wise parents is by no means an easy one. Some experiments, however, are under way which are making a contribution toward method. It is probably true that the subject cannot be taught in purely abstract courses. The most hopeful first step toward a solution lies in courses for the older girls in which they are given not only theoretical instruction but practical experience in the care and management of the younger child. It may even prove expedient for the school system to take in children of pre-school age, partly for the purpose of giving practical work with children to the older girls. Needless to say such a plan becomes feasible only if the school can show that it is better for the younger children themselves as well as for the young women.

E. *Vocational training and vocational guidance.*

Those whose chief interest has been in vocational guidance have long seen that vocational guidance and educational guidance cannot be separated but are parts of one continuous process. The only vocational advice readily worth giving to a child is advice to secure a specific kind of training. Such advice must be given, however, before the child leaves school and while there is yet time to secure the training. The fundamental problem, therefore, is that of educational guidance. If educational guidance is well done and proper means of vocational training are available, most of the problem of vocational guidance is solved by the time the child is ready to leave school.

The principle on which educators in this field have been proceeding is that our first obligation is to secure to every child as much general education as he is capable of taking and at a pace suited to his level of capacity. Our second obligation we have regarded as that of securing to every child some specific preparation for wage-earning before he completes his education. The point at which vocational education should begin seems to be dependent upon the capacities and interests of the child. For some children vocational education should be postponed until after the completion of a college course, when the child is ready to enter upon his professional training. These are the very superior children of the community. For those at the other end of the scale it might be necessary to begin vocational education as early as the twelfth or fourteenth year of age, before the child leaves the elementary school. It is the second element of this program upon which the present study throws doubt. We have been assuming that some content of vocational education could be found for every child in the school system. We are now beginning to question whether this is true for the group of children of very inferior ability. It still remains unquestionably true for superior children, those of the upper half of the level of ability. For them, the professions, the administrative positions in industry and commerce, various phases of public life, and the arts still offer scope for a wide variety of specific preparation.

The situation for the child of somewhat inferior ability, those in the lowest fourth or half of our group of working children, is totally different. Our former theory was that the children of this group should be trained for some phase of skilled manual work, but the demand for the skilled manual worker is decreasing very rapidly in the industrial world. The rapid increase in machine production of all kinds means that the modern industrial world needs more and more machine-tenders and fewer and fewer skilled mechanics. Even in the realm of office work the same tendency is observed. The modern office needs more and more comptometrists and typists and fewer and fewer bookkeepers, stenographers, and secretaries. Doubtless the demands for training in what remains of skilled work is higher than ever before. The kind of expert who can keep the machines of to-day in order and repair them, and still more one who can improve them or invent new ones, needs more training than the older type of skilled mechanic. Doubtless the same principle holds in the new type of office work. It requires a greater expert to plan and supervise the complicated office force of the large modern office than was the stenographer of the past. In short, the administrative and supervising positions in commerce and industry seem to be making greater and greater demands upon the individual and requiring more and more adequate preparation. This entire field is unquestionably the legitimate province of vocational training. We have seen, however, that many of our children, perhaps as many as a fourth or a third, will be compelled to earn a living at processes so routine in type that they offer no content for vocational training. Doubtless, office work even of the routine type done by the comptometrist and typist still demands training. There is content here for a course of at least a year in length. The same does not hold true of the machine-tending work of the factories. Most of the jobs of the modern factory can be learned in a few weeks by those of very limited intelligence and learned better in the factory than in the school. It requires more than a few weeks to develop maximum speed on a machine, but the acquisition of speed on a machine would not in any case become an educational project.

Our study has shown that the type of factory work open to young beginners can be performed satisfactorily by the poorest 10 per cent of our working children. This means approximately the poorest 5 per cent of the total school population. These children make more satisfactory workers than the more intelligent ones in the sense that they are better content and remain longer on the machine-tending jobs. They earn as much as the superior children of the same age and of three years more of schooling. They are as well able to secure work. That the work open to from 25 to 50 per cent of our children is of such a nature that the poorest 5 per cent are adequate to do it must mean that the rest will be compelled to earn a living by routine work which makes little demand upon their ability and offers no scope for educational preparation.

The dilemma of the school consists in the fact that the children whose future work is without educational content are the very ones who cannot keep up to the standards of traditional school work. They are incapable of doing the older type of school work normally and they need no preparation for the technique of wage-earning. As yet, this dilemma has been in no way met by the school. For the most part, even yet, the inferior children merely fail, become retarded in school, and leave school as early as the law permits with no preparation for life except that of having failed in school.

Until very recently the school has not even felt a sense of responsibility with regard to the children who drop out early. The general attitude toward them was that if they could not profit by the education offered them, that was their fault and the school was in no way responsible. Leaving school was the only possible outcome. The whole system has been dominated by a desire to prepare children for the next higher educational level. The efforts of the elementary school have been centered upon preparing children for high school and those of the high school on preparing children for college. Doubtless preparation for more education is one entirely legitimate and exceedingly important purpose of the school, but when it dominates education to such an extent that nothing adequate is accomplished in preparation for living for almost half of the school population, the tendency needs to be curbed. Now that scientific methods have made it possible to determine fairly early in a school career which children will be able to profit by prolonged training of the academic type and which ones are sure to be limited in accomplishment, there is still less excuse for merely selecting the superior and rejecting the inferior.

No educator really believes that allowing the inferior children to leave school, after the required number of years of academic failure, is a good educational policy. It has been allowed to go on merely because the school has not known how to meet the situation. Now that specific vocational training seems to be eliminated, the school is in a still more difficult position. It must try to find out how best to fit children of limited mental ability for a life in which wage-earning will take the form of monotonous labor. Let me suggest two elements in a solution of the problem. The first consists in the attempt to change the attitude of the child toward, and his type of interest in, his job. The second consists in more stress on preparation for a wise use of leisure time.

Much of the discussion of the modern industrial problem has taken the attitude that monotonous labor is necessarily injurious to the worker and that, therefore, the only legitimate attitude for education was to seek methods of reducing the amount of monotonous labor in industry. For education to undertake to stem the tide of machine methods of production with its subdivisions of labor and lead the world back to the period of production by the individual skilled artisan is to undertake the manifestly impossible. Mass production by machinery and the subdivision of labor represent the irresistible trend of the whole industrial world. The advantages in terms of economy of production are too great to be questioned or resisted. It is the machine production of modern industry that supplies thousands of wants that never could be filled without it, from cheap automobiles down to unlimited supplies of pins. The worker himself would not be willing to return to the older methods of production when he realizes that it would mean giving up a thousand comforts and luxuries of living which he now possesses. He wants the "flivver" and the inexhaustible supply of pins. What we need to do is to examine in a more scientific spirit the nature of monotonous processes, the length of time during which they can be maintained without injury to the worker, and their effect upon the worker under varying conditions.

Let us first examine the assumption that routine labor is necessarily injurious to the worker. It is the entire problem of drudgery and its place in life which we are considering. Certainly no one escapes drudgery; probably no one should. Let us take as an illustration one of the most creative and stimulating types of work in modern life—that of scientific research. It undoubtedly contains a great deal of mere drudgery. Laboratory research is filled with hours of labor which is as monotonous and as lacking in immediate elements of interest as that of the factory worker. Mr. William James once made the remark that the experimental psychologist was a person who could not be bored. Any one who thinks that the giving of the same mental test a thousand times or that the endless statistical processes underlying such a study as the present one represents no drudgery is vastly mistaken. Few, if any, kinds of real work in the world are free from drudgery. What is it, then, which makes us sure that some kinds of drudgery are injurious to the worker while others are not?

The hours of labor are certainly important. No scientific basis for the limitation of the hours of drudgery is available. The research worker is always in a position to control his hours of drudgery and see to it himself that they are properly limited. The factory worker is not in a position to do this. For him, the hours of labor must be limited by law. Gradually from an unlimited day we have legally reduced factory hours until we now have a standard eight-hour day. Some industries have been able to reduce the hours of labor still more. It seems probable that with the increasing efficiency of machinery, the better organization of industry, and an improved attitude on the part of the worker, six hours a day will be enough to enable the ordinary worker to earn a living wage. We have no reason to think that six hours a day of monotonous labor is enough to prove injurious to the worker, though again scientific data are lacking.

The second point to consider is that of the attitude of the worker toward his drudgery. The research worker understands fully the purpose of his drudgery and is intensely interested in its outcome. The factory worker is usually without an understanding of the total processes or an intrinsic interest in its outcome. Is there any way in which the industrial worker can be given a type of interest in his drudgery at all comparable to that of the research worker in his? The real elements of interest in modern industry lie in the phases of planning and managing and in the relation of the total industry to the community rather than in the actual processes of production. Little effort is now made to help the worker understand the industry as a whole or its interrelationships. Though he would not be capable of making an original contribution to this phase of industrial life, the ordinary worker can understand far more about it than he now does. Industry has made a beginning in this direction in the form of shop committees of workmen to assist in the management and in representatives of workers serving on the managing boards of the industry. Under such a plan it becomes possible for a worker to understand the organization of which he is a part and to offer contributions, if he is capable of making them. In addition to a share in the management, some workers are also given a share in the profits of the industry. Various plans by which the worker owns stock, or shares in profits directly, help to increase his personal interest in the undertaking as a whole.

So far we have discussed what industry can do, rather than what the school can do, to give the worker the kind of attitude toward drudgery which robs it of its sting. The part of the school is to prepare young workers to take this type of interest in industry. Probably the best method of accomplishing this end is that already suggested by Helen Marot in her book, *The Creative Instinct in Industry*. It is that the school help the children to organize simple productive enterprises of their own in which they can do the purchasing of raw materials, the organization and subdivision of the work, the drudgery of production, and the marketing of the product. It would make little difference what the product of the industry was or what the particular type of manual skill required. Sewing for the girls and wood- or metal-working for the boys offer plenty of scope for such a project. Stress should be placed upon an understanding of the whole process rather than upon the acquisition of any special type of skill. Generous help and supervision on the part of the teacher would be necessary. Children of an inferior grade of ability are obviously not capable of spontaneously organizing and carrying out such a plan. They can, however, understand and help. When they enter industry they should, as a result of such preliminary experience, make much more understanding members of shop committees and be in a better position to realize what profits mean and what constitutes a legitimate share of profits than they would be without the training.

If it proves to be possible for the automatic worker to become a part of a coöperative undertaking which he understands, to which he may contribute as much as he is able, and in whose profits he may share, there is no reason to assume that his drudgery will be any more injurious to him than the drudgery of the research worker is to him.

We have said that the second factor which helps to determine the attitude of the worker toward his job is that of the content of the rest of his life. If the hours of labor must be made short, then the way in which the worker spends his free time becomes of increasing importance. In other words, more and more stress must be placed upon education for leisure.

Only too often in discussing education for leisure, we talk as though the pursuit of cultural aims, such as art, music, literature, and the drama, were the only proper ones for leisure time. That they constitute a valuable use of leisure time for those who are capable of their pursuit there can be no question. There is as little doubt that more should be done by the school to foster an understanding of music, drama, and the arts, and a love for them than is done at present. This country is notably behind most European countries in its level of æsthetic appreciation and production. In discussing the group of children of somewhat inferior mental level, we must not lose sight of the fact that many of them will prove to be exceedingly limited in their æsthetic capacity as well as in their intellectual status. It is absurd to suppose that the majority of them could be led to devote the hours not employed in wage-earning to music, art, or literature, though doubtless some of them could. These same children, however, are capable of many simpler types of productive occupations, provided they are taught. Cooking and sewing for the girls, even though they have no immediate wage-earning value, are of great value as occupational resources. There is but a limited demand for dressmakers in the modern world, but there is an unlimited possibility for young women who wish to do so to make their own clothes in their leisure time. For the boys, gardening, wood-working, simple electrical work, and some kinds of metal work offer similar resources. Up to this time the occupations which we have just been discussing have been taught in the schools under the head of vocational training and with the idea that the children could use them for wage-earning. Now we are becoming convinced that there is little or no immediate wage-earning value in these disciplines. However, our conclusion is not that they should be taken out of the schools, but that they should be taught as personal resources for the children—in other words, as a part of general education rather than as part of vocational education.

The aim of the school should be to teach each child some type of productive work suited to his capacities and interests, and furthermore, to teach him how to conduct it individually as a personal enterprise. In short, the variety of occupations taught in the schools, from this point of view, should be increased and not decreased. The foes of vocational education who wish to exclude all types of training for manual work from the schools and reduce the curriculum to the traditional academic disciplines can gain small comfort from this point of view. If everything that we now class as vocational training or domestic science or art in the schools were excluded to-morrow, on the ground that it had no further wage-earning value, we should find ourselves compelled to put it back again the next day, enlarged and developed, because it has a very high value as training for life.

The discussion of productive occupations as a use of leisure time leads us insensibly to the topic of play and recreation. Work that is spontaneously initiated and enjoyed has many of the best elements of play about it and doubtless gives a higher type of satisfaction than mere play. However, most people—particularly young people—need mere play as well. Games and sports offer a field for the development not only of physique, but of elements of character and personality which are quite as important for society as mere intellectual attainment. To know how to play wholesome games, and how to be a good sport while doing so, is an exceedingly important asset to any child. The favorable effect of mere pleasure and happiness upon character and personality needs far more emphasis than our traditional puritanical background has allowed us to give it. Schools are waking up to the importance of wholesome recreation as an element in education. Particularly for children of somewhat inferior endowment it becomes necessary to teach games and sportsmanship because they are less able to devise the right kind of recreation for themselves. If every child left school equipped with a knowledge of sports and games, a taste for the right kinds of games, and a respect for the rules of the game, he would have a far better chance of making a wise use of his leisure time than most children have had in the past.

The task of the school with regard to the inferior children seems, then, to be this. We must look forward to preparing many children to earn a living at a process which has only remote interest and value, and make it possible for them to do so without injuring them by giving them genuine resources which will lend zest, interest, and vitality to the hours not occupied by the drudgery of earning a living.

Is there reason for pessimism with regard to the effect upon the citizen of the future cf the type of life which consists in earning a living by means of a comparatively short working day of monotonous labor in which he has some coöperative share, and in devoting the rest of his time to independent and self-initiated work and recreation? We think not. Indeed, there seems to be reason to believe that such a life offers better possibilities for development of a high type of citizen than that of the skilled artisan of the past whose disappearance we have been deploring. That it throws an even greater burden of responsibility upon the educational system, and implies a longer period of supervision and coöperation on the part of the school before the young worker is thrown completely on his own resources, there can be no doubt. Perhaps the day may come when, through community centers and the extension of educational efforts for adults, the schools will regard it as their function to assist all of the community, regardless of age, in the wise employment of the hours of leisure.

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